METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD — COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

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How to Take an Inventory Quickly and Accurately

By CHARLES W. HARDY

Secretary and General Manager, Casper Lowenstein, Inc., Div. United Carr Fastener Corp., Brooklyn, N. Y.

A Practical Way to Take Inventory As Taken by Large and Small Manufacturing Concerns in This Industry

EVERYONE is concerned when we hear "We must take a physical inventory." Immediately we see a picture of the stopping of production —small sales—confusion—hard, dirty work—long hours—working on holidays—expense—etc.

Generally inventory is taken once or twice a year and because it comes so seldom, it is a "hit and miss" affair; not much planned or directed routine. It is an important and costly task and should be done accurately and quickly.

What to Do First

Analysis of the Job.

1. Planning—Thought—By Management.
2. Executing—Work—By Factory Employees.
3. Supervising—Guidance—By Executive.
4. Clerical—Recording—By Office Employees.

These are the major factors employed when we accomplish any worthwhile achievement and therefore, they enter into the task of taking an accurate inventory just the same as getting out production.

Planning—Managements' Assignment

Date to start and finish is to be determined. Method to use—forms to use. Do we have to stop production? If so, for how long? Organization needed to carry out the job. Appointment of Inventory Supervisor.

Executing—Doing the Physical Work

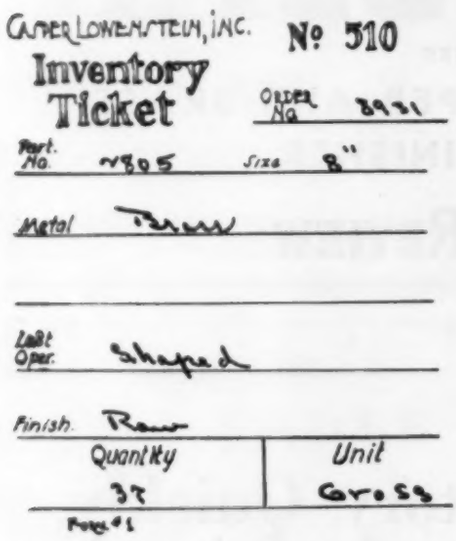
Orderly arrangement:—put same kinds of all raw materials and work together, get all containers, tote boxes, barrels, etc., correctly marked as to the tare weight. Put memo in each lot showing name of material or part and the quantity. Do not overlook work piled on top of shelves or on benches, as well as underneath. Place same kinds of materials and work together.

After this has been done—a clerical employee issues an Inventory Ticket, Form No. 1.

These forms are delivered to him by the Supervisor who records the numbers on a recap, and gets the signature on Form No. 2. (Distribution of Inventory Tickets).

Supervising—Teaching and Following Through

The Supervisor is appointed by the management and he is the "boss" during the Inventory Period. He must show how the job is to be done and to settle all questions that arise. When all Raw Materials,


CASPER LOWENSTEIN, INC. No 510

Inventory Ticket

Order No 8931

Part No. W805 Size 8"

Metal Brass

Last Oper. Shaped

Finish Raw

Quantity	Unit
37	Gross

Form #1

Fig. 1. Inventory Ticket. Form 1

Goods in Process, Supplies, Finished Stock are inventoried, (a ticket—Form No. 1 on each lot), he must personally check all information shown on some of the Inventory Tickets, and then when certain everything is inventoried, he starts to collect each and every ticket—compare the data thereon with the work.

A good careful experienced man can check quantities closely without having to count or weigh to determine if the quantity is correct.

After all tickets are collected in a department, they are immediately arranged in numerical order and any missing are generally easily located. These are then entered on Distribution of Inventory Tickets, (Form No. 2.) All returns and any missing or unused Inventory Tickets (Form No. 1) are given to him. His job is finished only after all Inventory Tickets are collected and are in numerical order and given to the office.

Clerical—Recording—Pricing—Etc.

The first task is to check the ticket numbers with the Distribution of Inventory Tickets, (Form No. 2), and when all accounted for, the next step is to arrange the tickets into the classes selected. Generally, a good classification is:

Raw Materials
Supplies
Goods in Process
Finish Stock

After this has been done, the same kinds are put together in their respective gauges and sizes, in brass sheet—brass rod—nickel silver—steel and etc. When arranged as wanted, then the ticket Form No. 1, is recorded on Inventory Sheets, (Form No. 3).

Before starting to list the tickets, show on the first line, the sub-classification. If you maintain perpetual stock records, it is good to use the same classification. If not, use judgment in establishing a classification of the major items so you can easily find any item when wanted after being recorded.

Pricing follows; then extending of value. If in a small organization, the sheets can be sent out to a concern where the extending and totalling can be done cheaply by computing machines.

Recap or Summary of Inventory. Use a Form No. 3 for this purpose, captions on top. A binder can be purchased for these forms for a few dollars and will hold many years of inventory records.

All Inventory Tickets when entered, should immediately be arranged numerically and filed where they

Form #2

CASPER LOWENSTEIN, INC.

DISTRIBUTION OF INVENTORY TICKETS

NUMBERED FROM	NUMBERED TO	DEPT.	RECEIVED BY	RETURNED FROM	RETURNED TO	MISSING
100	500	Raw Stock	Gus	435	500	None
501	550	Press	Al	541	550	"
551	600	Drill & Mill	Raymond	591	600	"
601	800	Assembly	Anthony	721	800	720
801	850	Buff	Tony	849	850	None
851	950	Painting	Dan	948	950	"
951	1000	Lacquer	Jane	951	1000	"
1001	1150	Pack & Ship.	Betty	1131	1150	"
1151	9000	Parts-Stock	Jim	1199	9000	1201-1296

Fig. 2. Distribution of Inventory Tickets. Form 2

can be easily located. Your C.P.A. may want to see a few tickets. Therefore, have them where they can be had quickly.

Goods in Process

This is the type of work that requires the most time to determine a value. Generally, the largest part of the Inventory is in Goods in Process, and it is also a task to price the same. It is usually done on the basis of the manufacturing costs which consists of Direct Labor, Direct Material and Manufacturing Over-Head.

If a small concern does not have a cost system, it is of course necessary to figure an estimate of the cost, and this is the basis used for pricing the Goods in Process.

There are various factors to be considered so a definite procedure should be considered and outlined by someone in authority and then this practice should be adhered to; otherwise there will be a fluctuation in the figures at each inventory period.

It is also common in many concerns, to consider parts made in anticipation of customers' orders and held in stock, to be classified as Goods in Process.

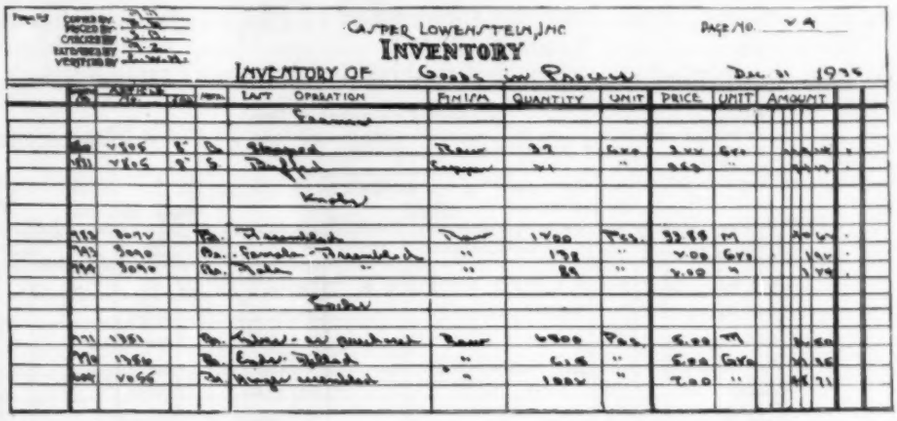

CASPER LOWENSTEIN, INC.
INVENTORY
PAGE NO. V 9
INVENTORY OF Goods in Process Dec. 31 1935
LAST OPERATION | FINISH | QUANTITY | UNIT | PRICE | UNIT | AMOUNT

Fig. 3. Inventory Sheet. Form 3

Obsolete Materials and Parts

Determine in advance of Inventory Period, which items are obsolete. If you want to show them inventoried at a lower cost price or at the value of scrap, it is a good practice to make up individual inventory sheets, (Form No. 3). It is necessary therefore that the inventory ticket be marked so that the person recording to the inventory sheet will know that the item has been considered obsolete.

Some concerns use classes; either A.-B.-C., or, 1.-2.-3. These classes have their definite meaning, such as follows:

Class A. To be considered at one half of cost value.

B. To be considered at one quarter of cost value.

C. To be considered at scrap value. In this case, the weight is generally shown.

Those items which are obsolete and have no value, of course, should be considered as void, or not considered, but it is a general practice in some cases, to show the item on the Inventory Sheet, and against it marked: "Obsolete—no value."

In many cases, this decision is reached by some person in authority, and before the inventory is priced, notations are made in the price column to the effect that it is obsolete and no extention is made.

The consideration of obsolescence is a very delicate matter, and it should be done by some person who knows whether or not the item is usable or salable, and furthermore, whether or not it has any value, and if so, at what proportion of its original cost should it be inventoried.

Compiling Inventory Tickets

Basis must be right, correct number and name of part, last operation, right quantity and correct unit. Duplicate of Inventory Ticket is to remain with the work.

Production

Get all orders completed as near as is possible. Return all raw material to the Raw Stock Department. Doesn't have to be done physically; can be done by records.

Purchasing

Defer as many shipments as is possible, thereby reducing actual inventory, outstanding liabilities, etc.

Materials Received

Some accountants will insist upon including all materials received, and those in transit shipped on an F.O.B. destination point or basis.

Pricing

If perpetual stock records are maintained and used in pricing, the quantity should be checked at the same time. A common practice is to draw a penciled line, use a rubber stamp "INVENTORY" and a date stamp "DEC. 31, 1935," and show the quantity. This method will find many mistakes and omissions. For all purchased parts and raw materials, price per unit should include all transportation charges.

Forms

Standard forms can be purchased at any large stationery store which will serve the purpose very well if you do not care to have the forms printed.

Upon completion of inventory, the Inventory Sheets are filed in a two post binder. The sheets are to be numbered in sequence and are sectioned off by a tag, bearing the year. One binder will hold many years' records. See drawing below.

Fig. 4. Binder for Inventory Sheets

Inventory Summary

This sheet is the detail broken down into the factors you sought and worked so hard to get. If you maintain the same classifications they will help greatly in each year's comparison. If there is a difference in the total, it can be easily found and also just what particular item or items made the difference.

This is the sheet your Auditor or C.P.A. will use. At least this is what the writer used to think, but he has learned that in many cases, after all the hard work is over, the accountant will make the figures read the way he "thinks" they should read. Even if he does this, the classification will be a big help to him in making up his Financial Statement.

However, if the Inventory is correct and is used, it will be the basis for a real picture of whether or not your business is showing a profit or loss. If wrong, your balance sheet, operating costs, profit or loss, won't mean much.

CASPER LOWENSTEIN, INC.

88 ROEBLING STREET
BROOKLYN, N. Y.

PAGE NO. _____

EXTENDED BY _____
VERIFIED BY _____

INVENTORY OF SUMMARY December 31st, 1935. 19

Page No.	CLASSIFICATION	DEP'T.	VALUE	TOTAL
1 - 5	Raw Materials	Stock	6,841 24	
6 - 6	Supplies		1,367 88	
7 - 11	Goods in Process	Assembly	1,329 08	
12 - 13	" " "	Buff & Lacq.	1,243 42	
14	" " "	Drill & Mill	529 64	
15	" " "	Press	474 23	
16 - 17	" " "	Soldering	1,744 81	
18 - 28	" " "	Stock	1,949 07	
29	" " "	Tool	227 89	
30 - 31	Finished Stock	Pack & Ship.	5,052 26	23,249 09

INDEX TO GOODS IN PROCESS

STOCK		PROCESS	
Compositions	18 - 19	Compositions	14-18-19
Eyelets	26	Eyelets	26
Frames	20 - 21	Frames	7-11-14-15-16-20
Knobs	22-24-25	Knobs	17-21-25
Hooks	23	Locks	10-11-12-14-15-16-21-24
Rings	28	Pockets	9
Rivets	26	Pins	8
Screws	26	Rings	25
Misc.	27-28	Rivets	9-26
		Screws	25-2
		Springs	8-28
		Tool Room	29
		Washers	8
		Misc.	26-1 -27-28

Fig. 5. Inventory Summary

Hot Galvanizing Bolts

Q.—We are hot galvanizing bolts and nuts and use considerable sal-ammoniac; we feel too much. Our threads do not come out clean.

A.—In order to hot-dip galvanize bolts with clean threads and at the same time using only a small amount of sal-ammoniac, it is necessary to go through some very definite operations. First, the articles must be put through a good commercial cleaning bath to remove all traces of oil and grease. The next step is pickling in a 4% solution of sulphuric acid, using an inhibitor to prevent the pickle from destroying the threads. The pickled articles are then dipped in a saturated solution of zinc-ammonium chloride, and drained; then they are gently dried.

After fluxing the bolts are shoveled into a wire basket and slowly lowered into the galvanizing bath at a temperature of 840° to 870° F. The temperature carried depends upon the condition of the zinc in the galvanizing bath, dross, etc. in the pot and condition of the work. A little sal-ammoniac is sprinkled in the baskets and the work is poked with a poker to be sure all parts of the bolts are coated. The baskets are then lifted from the bath, drained well of metal, and quickly placed in a centrifugal machine revolving at a speed of about 900 R.P.M. The next step is quickly to empty the basket into a water tank and then raise the work out of the water by a perforated screen into which the bolts fall. A little experience will give a very smooth finish with practically no zinc in the threads.—**W. Imhoff.**

Recommended Practice for the Common Aluminum-Copper Alloys

A Report of Non-Ferrous Division Committee on Recommended Practice of the American Foundrymen's Association, Presented at the Meeting in Toronto, Canada, August 20-23, 1935.—Part 2*.

4. Heat Treatment[2].

The mechanical properties of many aluminum alloys may be materially improved by a suitable heat treatment. The type of heat treatment employed is determined in most cases by the properties desired in the castings.

Alloys given a solution treatment possess the highest ductility and impact resistance. This treatment consists of heating the casting to a known temperature, holding at that temperature for the correct length of time, and then quenching. The object of this treatment is to bring the soluble constituents of the alloys into solid solution, and to retain this solid solution in a supersaturated condition by rapid cooling. A heat treatment of this type is desirable when maximum shock resisting properties combined with high strength are required.

A precipitation treatment following the solution treatment results in a material increase in the yield strength, tensile strength, and hardness of the alloy at some sacrifice of ductility. This treatment is carried out at a relatively low temperature for a predetermined length of time. Maximum strength and hardness are obtained by prolonging the precipitation treatment.

Certain alloys are also subject to improvements in strength and hardness through a precipitation treatment only. Such a treatment, either by itself or in connection with a solution treatment, and with proper selection of time and temperature relations, is also used to m nimize the tendency for castings to "grow" when they are subsequently placed in service at elevated temperatures. A precipitation treatment alone is often used in the case of very intricate castings to avoid possible quenching stresses which might be introduced if a solution treatment were used, and providing that the resulting properties in the casting are satisfactory. Such treatments usually increase yield strength, tensile strength, and hardness, but do not improve elongation.

5. Defects, Their Causes and Prevention.

The principal defects in aluminum alloy castings other than those resulting from improperly tempered sand, are those due to poor molding or core room practice and dross and inclusions, shrinkage, porosity, and cracks. Such defects are largely a function of melting, pouring, and gating practice and their elimination must come through improvement or change in some or all of these factors.

Dross and blow holes are usually caused by improper pouring and gating which permits too great an agitation of the metal as it is poured and as it enters the mold cavity. Too much dirty scrap in the melt and improper skimming of the metal, both in the melt ng furnace and pouring ladle, are responsible for much dross being carried into the castings.

The presence of shrinkage cavities in certain parts of the casting indicates lack of feeding or perhaps a too slow rate of solidification. This type of shrinkage can usually be eliminated by the use of adequate risers; by a suitable combination of chills and risers; by a change of gating such as to supply cooler metal to the areas in which the shrinkage has occurred.

Surface shrinkage when accompanied by relative large grain size is generally an indication of a high pouring temperature. By increasing the number of gates it may be possible to pour the casting at a lower temperature, thus decreasing the amount of hot metal at any one point and overcoming the tendency for shrinkage to occur. High pouring temperature is not, however, the only cause of surface shrinkage. It is sometimes caused by hard ramming, which lowers the permeability of the mold. Surface shrinkage on cored castings sometimes indicates a core shift or sag resulting in uneven wall thickness, which in turn affects the rate of sodification. Thin castings will often show surface shrinkage at the gates; this may be eliminated by a small riser in the runnner outside of the gate.

The question of pinhole porosity, in the form of tiny cavities often uncovered when castings are machined, continues to puzzle foundrymen. Its origin is not clearly defined but it usually is the result of a combination of a number of factors. For this reason there are listed below the principal factors which influence the occurrence of pinhole porosity.

1. High melting and pouring temperatures—absorption of gas in melting.
2. High percentage of scrap—unknown origin or composition and not clean.
3. Insufficient feeding.
4. Rate of solidification too slow.
5. Sand too wet or rammed too tight.

* Part 1 was published in our November Issue.

[2]Many of the heat treatment processes for aluminum alloys are covered by a number of existing U. S. Patents, including Nos. 1,508,556, 1,572,488, 1,394,534, and 1,572,487.

6. Composition of alloy—porosity will vary with types of alloys.

Cracking in castings is the result of "hot shortness" in the alloy, at temperatures just below the freezing point. There are two general methods in use to minimize cracking. The first of these is to eliminate as much as possible, potential sources of resistance to contraction as the casting cools through the hot short range. The second is to strengthen these weak parts of the casting by the use of ribs, fillets, or fins. Gating technique which has for its purpose the production of the soundest possible castings will often prevent cracking which would occur when the principal thought is only to get the liquid metal into the mold cavity.

B. RECOMMENDED PRACTICE FOR THE COMMON ALUMINUM-COPPER ALLOYS

1. Chemical Control Limits.

Alloy	Cu. Per cent	Iron Per cent	Si. Per cent	Zn. Per cent	Other Elements
B-11	7.0-8.5	.....	.....	0.2 Max.	Total impurities less than 1.5%
B-12	7.0-8.5	0.8-1.2	1.0-1.5	0.2 Max.	Total impurities less than 0.3%
B-13	6.0-8.0	1.0-1.5	[a]	1.0-2.5	[b]
B-14	11.0-13.5	.....	.....	.....	

[a]The use of higher silicon content up to about 2.0% improves the casting qualities of this alloy without any adverse effect on the physical properties or machining characteristics of the casting. This is recognized in the following specifications.
S.A.E. 33—2.0% Max.
A.S.T.M. B26-33T Alloy C—1.0-3.0%.
[b]A.S.T.M. B26-33T Alloy C—Magnesium 0.05% Max., Manganese 0.3% Max., and other elements 1.0% Max.

The strength of the aluminum-copper sand castings increases rapidly with copper content up to about 4 per cent and then more slowly up to about 12 per cent. Conversely, the elongation decreases continuously and the alloys become quite brittle at 10 per cent copper or above. The most favorable combination of strength, elongation, toughness, and casting properties seems to be reached at about 7 or 8 per cent copper.

The addition of controlled amounts of silicon and iron as in alloy B-12, effects a distinct improvement in the casting characteristics of these alloys. Iron tends to reduce the "hot shortness" of the alloy, thereby preventing to a considerable extent the occurrence of cracks. Silicon promotes fluidity of the alloy, making it easier to cast.

Another modification of the original 8 per cent (B-11) alloy consists in the addition of small amounts of zinc for the purpose of improving machineability. At the same time, it is possible to increase the iron content over that of alloy B-11. This alloy containing zinc is alloy B-13.

Alloy B-14 containing approximately 12 per cent copper and therefore rather brittle, has been found especially suited for castings requiring pressure tightness but which are lightly stressed and not subjected to impact shocks.

3. Conforming Specifications.

Alloy		
B-11	Aluminum Company of America	No. 12 Alloy
	Society of Automotive Engineers	No. 30 Alloy
	U. S. Army Ordnance Department	57-72 Grade 5
B-12	Aluminum Company of America	No. 212 Alloy
	Society of Automotive Engineers	No. 36 Alloy
	American Society for Testing Materials	No. B26-33T Alloy B
B-13	Aluminum Company of America	No. 112 Alloy
	Society of Automotive Engineers	No. 33 Alloy
	American Society for Testing Materials	No. B26-33T Alloy C
	U. S. Army Ordnance Department	57-72 Grade 7
B-14	Aluminum Company of America	No. 109 Alloy
	Society of Automotive Engineers	No. 32 Alloy
	American Society for Testing Materials	No. B26-33T Alloy E

4. Development.

The aluminum casting industry in America originally developed around alloys in which copper was the principal hardening ingredient. The most widely used of these alloys, commonly known as No. 12 alloy, was made by the addition of approximately 8 per cent copper to commercial aluminum ingot.

For a long time, alloy B-11, commonly known as No. 12 alloy, was the standard casting alloy but in recent years it has been replaced largely by other alloys having better foundry characteristics. While alloy B-11 is a fair casting alloy for general purposes, other alloys were developed to meet the more exacting requirements of the trade. Variations from the original chemical composition have created a group of alloys known as the common aluminum-copper alloys.

These alloys are easy to cast providing that the pattern is not too intricate. They are somewhat "hot short" and therefore susceptible to cracking under certain conditions. They are reasonably hard and machine well. The corrosion resistance of this group of alloys, because of the high copper content, is not nearly so good as that of the aluminum-silicon alloys

2. Physical Properties of Sand Castings.

	Alloy B-11	Alloy B-12	Alloy B-13	Alloy B-14
Ultimate Tensile strength, Lb. per sq. in. (Min. to Avg.)[a]	19000-22000	19000-22000	19000-23000	21000-24000
Yield Strength, Lb. per sq. in. Permanent Set = 2.0% (Avg.)	14000	14000	14000	14000
Modulus of Elasticity, Lb. per sq. in. x 10^6 (Approx.)	10	10	10	10
Elongation, % in 2 in. (Min. to Avg.)[a]	1.5-2.0	1.0-2.0	1.0-2.0	1.0-2.0
Brinell Hardness, 10 mm. ball—500 Kg. load (Approx.)	65	60	70	75
Ultimate Compressive Strength, Lb. per sq. in. (Approx.)[b]	38000	38000	44000	45000
Specific Gravity (Approx.)	2.83	2.84	2.86	2.89
Weight per cu. in. (Lbs.) (Approx.)	0.103	0.103	0.104	0.104
Pattern Maker's Shrinkage—inches per foot	1/10-5/32	1/10-5/32	1/10-5/32	1/10-5/32
Solidification Range—°F. (Approx.)	1175-1004	1175-1004	1175-1004	1160-1004
Electrical Conductivity (Percent. of annealed copper standard at 20°C.) (Approx.)	35	32	30	39
Endurance Limit, Lb. per sq. in. (R. R. Moore Machine 500,000,000 Reversals)	7500	7500	8500	10000
Coefficient of Thermal Expansion (Per °F. x 10^{-6}) (68-212°F.)	12.5	12.2	12.2	12.2
(68-12.5 572°F.)	13.6	13.3	13.3	13.3

[a]Tension values determined from standard A.S.T.M. ½ in. diameter separately cast test specimens.
[b]Usually not included in commercial specifications because of the difficulty of measuring small elongations with accuracy.
[b]Results of tests on specimens having 1/r ratio of 20. All specimens failed by lateral bending.

and aluminum-magnesium alloys or heat treated alloys containing copper in lower percentages.

5. Field of Use.

The common aluminum-copper alloys are still used quite extensively for castings which do not require exceptionally high mechanical properties or resistance to impact. They are employed in the automotive industry for crankcases, oil pans, transmission housings, manifolds, carburetors, and miscellaneous fittings and parts for body, chassis, and engine.

In addition, the alloys are used in casting various parts of washing machines, and as die castings for vacuum cleaners, multigraphs, typewriters, and adding machines. It has been estimated that 50 per cent of the aluminum foundry output of castings is made in the common aluminum-copper alloys.

The majority of such castings are made in the 8 per cent copper-2 per cent zinc alloy (B-13 alloy). A much smaller number of the castings are made in the remaining three alloys. The original 8 per cent copper (B-11) alloy is still used extensively for patterns, matchboard, and core box equipment. Alloy B-14 is well suited for pressure tight castings such as automotive manifolds, pump housings and carburetors, which are lightly stressed and not subjected to impact shocks.

This Report will be continued.—Ed.

Oxidizing Nickel Silver

By GEORGE JENSEN
Foreman Plater, Chicago, Ill.

IN A recent issue of this publication there appeared an inquiry requesting information as to what is the proper procedure for oxidizing nickel silver directly. In answer to this request there appeared in a subsequent issue an article advising that nickel silver could not be oxidized directly but would first require copper and then silver plating, before any oxidizing could be done.

The writer of this little article is the foreman of a large plating department and has formula for oxidizing nickel silver directly without any previous plating. This oxidizing operation can be done in bulk, without the necessity of wiring, etc.

At the time the writer was in his "teens" in his native Norway, a beloved uncle, a professor of chemistry, had a hobby of puttering around, making up formulas for everything under the sun, and studying particularly the reaction of various acids on base metals. Through the interest of this uncle the writer obtained a considerable knowledge of chemistry, particularly the formulas and acids pertaining to finishing, etching and plating, as he was at that time serving as an apprentice in the plating line. The formula for oxidizing nickel silver was one of my uncle's pets and the writer would like to consider this little article as a tribute to his uncle to whom he owes what little measure of success he has enjoyed.

The following formula is based on the proper proportion to give the right solution for oxidizing small pieces. Of course the quantities would be proportionally larger for larger quantities of oxidizing solution.

Hydrochloric acid	1 gal.
White arsenic	10 oz.
Copper sulphate	10 oz.
Ferric chloride	2 oz.
Copper acetate	2 oz.
Ammonium chloride	1 oz.
Hyposulphate soda	1½ oz.

Heat the hydrochloric acid, and when hot put in the white arsenic. When the white arsenic is completely dissolved, mix in the balance of the formula.

It must be definitely understood that this solution can only be used while cold. The article can be placed in a plater's basket or wired and dipped possibly half a dozen times in the solution, rinsed in cold water and then dipped in a solution of sodium cyanide and then rinsed again in cold water. After this rinse, the article should again be dipped in the oxidizing solution and the process is then complete.

The result should be a jet black oxide which can be scratch brushed if a solid black is desired, and can be readily spotted off for highlights.

Machining Die Castings*

MACHINING of zinc alloy die castings has never proved particularly bothersome but there have always been certain precautions, certain slight variations in practice advocated by men whose varied experience should qualify them as advisors.

Concerning **lathe** and **boring machine tools** these men agreed that a good grade of high speed steel was satisfactory for almost everything they encountered. Occasionally on very high production jobs or where extreme accuracy was required a cemented tungsten carbide tool was justified. A rake between 15° and 20° is unanimously satisfactory. The cutting angle ranged between 62° and 69°, although one man has used an 82° cutting angle. Clearance angles range from 6°-8° to 10° or even 20° for high speed.

Milling cutters of high speed steel seem to be satisfactory with angles approximately the same as for working brass. One man, however, advised "considerable rake on the cutting edge."

Ground high speed steel **taps** seem to be most generally used although for less than ¼" diameter plain carbon tool steel taps have proved practical. For diameters of less than 5/16" two fluted taps are generally used, while for larger diameters three and four flutes gain a maximum tap bearing and a resultant smoother thread.

Drills of regular carbon tool steel are generally satisfactory although for large diameters, high speed steel tools are sometimes desirable. Plenty of clearance seems important and in cases of deep drilling or extremely rapid operations a polished flute helps prevent clogging with chips. A stationary, stable spindle without end play in the thrust bearing seems important to prevent gouging when the drill breaks through the work.

Two recommendations for a **lubricant** were made: (A) 3 parts mineral oil, 2 parts kerosene. (B) "a fuel oil of the type known as 32-36 furnace oil."

* From The Zinc Alloy Pot, Vol. 3, No. 3.

What is Phosphor Bronze?

By M. G. CORSON
Consulting Metallurgist

A Critical Examination of This Well Known Alloy

ABOUT 65 years ago a Belgian industrialist, Montefiore and a German scientist, Kuentzel, reinvestigated the already known but rarely used addition of phosphorus to tin bronzes of various compositions. Their work constituted one of the first attempts on the part of technical men to develop new alloys on an experimental basis. It had the consecutive backing of three governments (that of the Russian Tzar being one of them) who were interested in improving the quality of bronze used in the casting of cannons.

The results were most gratifying from the commercial viewpoint. A very broad patent covering ternary bronzes with up to one per cent phosphorus was obtained. An extensive technical report was published and the new alloys—probably the first ones sponsored by scientific men, were launched upon their industrial career. Today even schoolboys in every more or less civilized country are familiar with the name "phosphor bronze," and to both the layman and the average technical man it conveys the idea of an alloy of superior hardness, toughness and other valuable characteristics.

The claims put forward by Montefiore and Kuentzel, as well as by their British and American licensees, the Dick brothers, were really extraordinary. Altogether some fourteen advantageous points were listed. It was claimed, for instance, that the elastic limit of phosphor bronze was about 70% higher than that of the corresponding ordinary bronze, while the ultimate strength was raised by fully 174%. Elongation, it was also claimed, increased, as well as soundness and hardness, to say nothing of resistance to corrosion. And further, it was claimed that the termal conductivity of phosphor bronzes approximates fully 80% of that of pure copper.

If we consider the fact that no one has been able till today, to produce a cast phosphor bronze with over 40,000 lbs. of strength and 23,000 lbs. of yield point, the plain bronzes made by the contemporaries of Montefiore and Kuentzel probably did not go beyond 14,000 lbs. in yield point and 15,000 lbs. in ultimate strength, if we accept as authentic the improvement figures claimed by the inventors of phosphor bronze. True enough, the technique of bronze casting of those times was not particularly good. Nevertheless, no bronze with say 10% tin around which the gun and machinery bronze compositions used to oscillate, can be cast with less than 30,000 lbs. strength. Those high values of improvement were obtained simply by comparing **wrought** phosphor bronzes with plenty of work hardening present, with analogous plain compositions in the **cast** state.

The inventors and sponsors of phosphor bronzes suggested their uses in practically every field where copper base materials were requird. These high hopes did not materialize. It became known, by and by, that phosphor bronzes cannot be used for castings where the ability to withstand, without leaking, high internal pressures, liquid or gaseous was required. So to-day, only two types of phosphor bronze are generally used, industrially, although the volume of these uses is indeed very large.

One is a bronze with 4-6% tin and minute amounts of phosphorus. It is used for strips and wire but never as cast. Practically all bronze screens are made of this alloy as well as all fine springs.

Strange as it is, it seems that never were any experiments undertaken for the purpose of proving beyond doubt that phosphorus is an important component of these wrought bronzes. So while we know that bronze springs are the most elastic of all copper base alloy springs*, we do not know whether this depends to any extent upon the presence of phosphorus. And again, while we know that phosphor bronze wire is practically immune to season cracking, we do not know whether this is due to the peculiar action of phosphorus; nor do we know whether such wire could not be properly supplanted by aluminum bronze, cupro-nickel wire or others.

On the other hand we know that the presence of phosphorus makes tin bronzes hot short. Without phosphorus a billet can be reduced to rod by hot rolling it between 600 and 750 C., even if it contains 10% tin. With a few hundredths of one per cent of phosphorus present not even a 3% tin bronze can be successfully hot rolled.

In the light of the above we must conclude that the technical value of phosphorus in wrought bronze was never proven and may even be doubtful.

The second type of phosphor bronze is the cast gear bronze, the composition of which oscillates around 11.5% tin and 0.3% phosphorus. The outer limits are 10-13% tin and 0.05 to 0.50% phosphorus.

The range here given represents one in which mechanical characteristics change most rapidly with

* Show the minimum amount of lag.

the tin content and conditions of cooling. A 10% tin bronze well made and cast in sand to form a gear blank of say 3" thickness will show an elongation of 40% and a hardness of 55 Brinell only. One with 13% tin, chill cast in the same shape, will have less than 5% elongation but a surface hardness of 130 Brinell. For the average composition containing 11% tin and 0.3% phosphorus and cast in sand with chills for the outer rim the best values are 40,000 lbs. ultimate strength; 23,000 lbs. yield point; 10% elongation, and 90 Brinell.

Ultimate strength of alloys in the same range is practically unaffected by their composition; 45,000 lbs. can be had for a 10% tin alloy and not less than 38,000 for a 13% tin alloy.

As we see, a difference of 0.1% in the content of tin plus a difference in the rate of cooling may change both hardness and ductility to a great extent. This makes the investigation of corresponding characteristics extremely difficult. It would be still more difficult to ascertain the additional influence of phosphorus, whether it be present in traces (up to 0.05%) or to the extent of 0.5%. And indeed, no definite investigation of the comparative characteristics of gear bronzes with and without phosphorus was ever made.

And because the above given characteristics of a phosphor bronze fall entirely within the range of values obtainable even in the total absence of phosphorus (90 Brinell is by no means a high figure) we must conclude that nothing proves the advantages of using a phosphor bronze instead of a plain one.

One feature decidedly in favor of phosphorus is the increased fluidity of the liquid metal, if as little as 0.05 phosphorus is added. The alloy becomes more mobile and should the surface of the casting carry an intricate design of fine features the use of phosphorus is indicated. No other mixture will reproduce them as faithfully.

This increased fluidity should not be mistaken for an improved "castability." It is hopeless to add phosphorus when the metal must run far along a mold of intricate design and thin section. Here the decisive features are the amount of heat carried by the liquid alloy and the conductivity of its contact surfaces with the mold. Phosphor bronze carries the minimum of a protective film and, therefore, the heat conductivity factor from its surface to that of the mold is very high. Cast at the same temperature, an alloy containing 1% zinc will run for a longer distance and one containing 0.15% aluminum will run much further. Phosphorized bronze will show the shortest run and plain bronze will come second.

The increased fluidity of a phosphorized bronze depends upon the peculiar action of phosphorus upon the surface tension of nearly all liquid metals, copper and bronze being no exception. It is sufficient to remember that fine castings of steel and gray iron are always made from metal containing phosphorus. Why phosphorus should act that way we do not know. The generally accepted idea that phosphorus eliminates oxides is far from certain. It was never proved that a bronze might contain considerable amounts of films of tin oxide, the black thin spaces in the micrographs of cast bronzes being mainly micro-shrinkage cavities. On the other hand the reduction of such films of suspended tin oxide by the tiny amount of dissolved phosphorus is hardly possible.

The drop in surface tension caused by the addition of small amounts of phosphorus brings about a rapid evolution of absorbed gases. Unfortunately not all of the absorbed gas escapes when the metal is still completely liquid; a considerable part will evolve during its solidification in the mold. That part of the gas which forms in the first stages of this solidification will form pinholes at the surface and blowholes inside the casting. What escapes in the latter stage of solidification forms films between the grains. These are invisible to the eye but just as deleterious to the casting. A cross section that "looks sound" to the eye may frequently be very poor due to the microscopic gas films.

With increased amounts of phosphorus the tendency of the metal to let the absorbed gas evolve increases greatly. Hence a poorly melted heat of a bronze will look the worse the more phosphorus is added. Foundrymen who exaggerate in their generous use of phosphor-copper to deoxide their melts, are frequently compensated by castings the whole surface of which is full of tiny holes, black inside and running deep into the metal.

That is why all of the few investigations of phosphor bronzes made by scientists who were limited in their choice of melting apparatus and help (mostly students with little if any foundry experience) resulted in tables of data which were all over the map and hence worthless. The **uncontrolled** evolution of gas affected all their results.

That is also why so frequently, gear blanks of phosphor bronze as well as shaft jackets of phosphorized bronze used on steamers are full of blow holes and tin-sweat—the seepage of the delta phase into the channels formed by such gas holes. Of all bronzes, phosphor bronze must be made under the best controlled melting practice. The molten metal must not be allowed to absorb much gas before phosphor copper is added.

But again, gear blanks, worm blanks and the like are not being cast to size. They usually undergo a considerable machining. Hence the fluidity of phosphor bronze is of very little if any importance in the casting of such articles. This eliminates the last advantage which might be claimed for phosphor bronzes in the 10-13% tin range. Fluidity is of no importance. Hardness is not enhanced. Ductility is most certainly decreased. Ultimate strength is at best, unaffected. And so we come to the point where it seems tha. no scientific reason can be offered in favor of phosphor bronze.

Silvering by Precipitation

Q.—How can I get a deposit of silver on watch dials without electric current?

A.—Precipitated silver is used on some types of high grade watch dials where a dead white mat finish is desired. A raised grain effect is obtained at the same time. The following formula can be employed, using precipitated silver:

Precipitated silver	1 part by wt.
Cream of tartar	2 parts by wt.
Sodium chloride	2 parts by wt.

Mix dry, add enough water to make thick paste. Apply by running with stiff brush. The proportions may be varied depending upon grain and mat desired. The best results are obtained on alloys rich in copper such as gilding metal.

—**T. H. Chamberlain.**

Our Experience in Cadmium Plating in a Barrel

By AUSTIN F. FLETCHER
Foreman Plater, The Brewer-Titchener Corporation, Binghamton, N. Y.

Saving Metal and Getting a Better and More Uniform Plate*

WE HAVE kept track of all our cadmium plating since last March, 1934, and in that time we have plated 21,000,000 pieces of work, which amounts to 390,000 square feet of surface and 379,000 pounds of work. The idea of this experiment was to find out how much excess cadmium we were using to deposit a required thickness. In other words, if we had to deposit an average thickness of one ten-thousandths, which we require on these samples, we used a certain percentage of cadmium over and above what we would use if we had an average covering on the pieces.

At the start of this experiment we had no system of plating. We just loaded the barrels and let them run, the same as the rest of the boys do. That was in March of last year. In May I put in an additional tumble cleaner. Before I put in the tumbling cleaning, I was running the free cyanide at about eighteen ounces. That was to take off some of the dirt that we did not clean off at the beginning. We used to soak the work and just dump it into the barrels and let it go. Now we just throw the work in and tumble it in a cleaning solution after soaking, and then put it in an acid dip. The difference in the excess cadmium used by using an additional tumbling cleaning and with the acid dip was reduced from 170 per cent to 130 per cent. That was in two months' time, from May 21 to July 11. (See Charts on pages 432 and 433).

When I saw the forty per cent difference, without having any measurements on any of these pieces, I figured up some of them and some of them were a little bit too deep, so I had one of our draftsmen figure the surface on the rest of them. After we got the square foot surface, we scheduled each piece through the plating barrels at an average time.

All of these pieces up here (indicating samples) were gathered up around the plant. Probably some of them had laid around a month or a year. These two pieces have an average thickness of two ten-thousandths, and the rest of them have an average thickness of approximately one ten-thousandth.

As soon as I got the square surface on all these pieces and scheduled the time through the barrels, it immediately cut the excess cadmium down to between forty-five and fifty-five per cent, July 12 to December 14. At that time I did not know what the barrel efficiency was, so I used a figure that they all seemed to agree upon for a barrel after it has been in use for several years, which will probably give you sixty or seventy per cent. I used that as a figure and I used an excess cadmium of forty-five to fifty-five per cent. Then I decided that I would find out what the actual barrel efficiency was.

I ran an experiment on barrel efficiency. The barrels were approximately five years old. I have three experiments here in the 42" barrel. One had seventeen square feet and one had fifty-nine square feet and the other one had twenty-three square feet. Each one of those loads was loaded up to the center of the barrel, or over and above the center, or three-quarters full. On that barrel which was five years old, I had a barrel efficiency of 86 per cent, of 86.4 per cent, and 87.9 per cent. That was with the cadmium solution of two ounces of cadmium and eight to ten ounces of free sodium cyanide.

I have two barrels. One is forty-two inches and one is twenty-four inches. The forty-two-inch barrel has 154 gallons of solution and we carry 150 pounds of anodes. The twenty-four-inch barrel has 100 gallons of solution and approximately 100 pounds of anodes. There are negative connections on each end. Panels have three-sixteenth perforations. Barrels make four and one-half revolutions a minute.

On the twenty-four-inch barrel I ran approximately twenty tests, but I have only five of them here. Two of them came to 93.7 per cent efficiency, one was 100, one was 103, and one was 114. We have some other tanks that are on the same generator, and we had a fluctuation of the ammeter, which would give you a different variation in your barrel efficiency.

About six months ago I put new panels in the barrels and decided to try the efficiency with the new barrels, in the meantime experimenting, that is, by testing the pieces as we went along, with the new barrel. I found that we were depositing more metal than we had been depositing previously, so I have been reducing the cadmium and the free cyanide down the line and I found that I had one and one-half ounces of cadmium and six ounces of cyanide and was getting very good results.

So I ran a barrel efficiency test on both barrels. On the forty-two-inch barrel I ran one load for ninety minutes and one load for sixty minutes, and both of them showed a barrel efficiency of 100 per cent. In the twenty-four-inch barrel, one was run for sixty minutes and one for ninety minutes, and they both

*From The Monthly Review of the American Electro-Platers' Society, September, 1935. A Paper read at the Bridgeport Convention, June, 1935.

showed a barrel efficiency of 98 per cent, although I put a little more free cyanide in and brought it up to 100 per cent.

In some of the literature I have been reading they claim that one can take a load and take fifty or sixty square feet and stick it in there and plate it in fifteen minutes if you want an average thickness. I took sixty square feet of a ring and sixty square feet of a pin. The ring loaded the barrel to approximately three-quarters full, and on the barrel efficiency I had 109 per cent. Of course, we had a fluctuation in the ammeter, which would give you a different percentage. With the pin, that is, a small piece, the volume was much less; in other words the danglers in the barrel were just about touching it. It dug into the load a little bit and we had a barrel efficiency of thirty-six per cent. When I discovered that I loaded the barrels to the center of the barrel or over. Of course, a lot of these things are light weight and they take up a lot of space and there is not much surface. When we get into the heavier stuff, the bolts and nuts, and so forth, we just loaded it in there and plated it a longer time*.

After I got the 100 per cent efficiency, I found I was running between thirty and forty per cent excess cadmium, and I could not find out where it was going. We sent the ammeter away and had it checked and it came back and I still had the same difficulty. I decided I was losing a whole lot. We wired up twenty-five of these clamps and I had a fellow sit along side of the cadmium tank and dip them in the cadmium tank. We had three or four pails along the line with fresh water in them, and he rinsed them in each pail as he went along and then he had fresh water on the end and he rinsed them off in that. Then he stuck them back in the tank. He did that twenty-five times, that is, with twenty-five clamps, which gave us a surface of 250 square feet. This was in the cadmium solution of two ounces of metal and eight ounces of free cyanide. Those 250 square feet of surface dragged out 3.5 ounces of cadmium. (That was not in the barrel; you are going to lose some because it sticks to the barrel), and ten ounces of free cyanide. In other words, I found it was costing me $.001 per square foot for the cadmium and cyanide dragged out.

We got a separate tank along side these two barrel platers and every load was sprayed over this tank and thus we saved all that drag-out. We use that as a rinse tank before we go into the cadmium tank. In other words, we started dragging back the dragout. We immediately went down to about thirty-five per cent, December 17, 1934 to April 5, 1935. Then I decided that the boys were chiseling a little bit and were not watching their ammeters and their time. I told them they would have to keep the time and the amperage accurate at all times. So they went on the job and kept watching it.

From here down, from April 8, 1935, to May 24, which was two weeks ago, these last five weeks have shown an average of sixteen per cent of excess cadmium. If we take the last two weeks on this chart and the last two weeks that I do not have here, it figures up to thirteen per cent excess cadmium. The only way I can account for that is that probably I am losing some of the drag-out which I do not get.

While we were making these other experiments, I was running the solution at two ounces of cadmium and eight to ten ounces of cyanide. I used 1,529 pounds of cadmium, and I also used 1,045 pounds of sodium cyanide. In other words, for every pound of cadmium I used, I required .683 pounds of sodium cyanide. That was with the old barrel. When I got the 100 per cent efficiency and the solution at one and one-half of cadmium, six ounces of cyanide, I reduced the sodium cyanide required to .497, or a half pound of sodium cyanide required for each pound of cadmium used.

I got away from this drag-out business for a minute. We ran it on these clamps. Then we ran one on bolts and nuts, and went through the same procedure. I found that I got a half ounce more metal and five ounces more of sodium cyanide in the drag-out, and the drag-out on bolts and nuts would be $.0011 per square foot.

At the same time we also made a test on the cleaner we were using. All the work goes through a soak cleaner and then a tumble cleaning operation. We use a lot of cleaner in the tumbling cleaner because the grease comes to the top and as the barrel turns around we let it flow off rather than try to save a little bit. We used 823 pounds of cleaner and cleaned 145,000 square feet of work at a cost of .00056 cents per square foot.

While we have been going along with that, we started to make a test on average thicknesses and the minimum thicknesses. We wanted to find out just how much cadmium we had to put on in excess to get a minmum thickness. Of course, all my stuff is average thickness. I saw these specifications coming up in the Bureau of Standards and I thought I would find out what it was going to cost us for minimum thickness. I have been running some tests to find out.

For thirty-three and one-half square feet of surface in the tank I had 340 amperes on the load. That was when the barrel efficiency was eighty-six per cent with the solution of two ounces of cadmium and nine ounces of cyanide. I plated that load for seven minutes before we could get a minimum thickness of .00005". I found that I had deposited 108 per cent excess cadmium to get a minimum thickness of .00005". For the .0001" I had used eighty per cent excess cadmium and for the .00015" I used 66%.

I loaded the barrel heavier and put in forty-five square feet and I reduced the amperage on the barrel to 250 amperes, and I had the barrel efficiency of 100 per cent and the solution at one and one-half ounces of metal and six ounces of cyanide. I plated the five hundred-thousandths where I got 108 per cent efficiency. I reduced that to sixty-six per cent. On the one ten-thousandth where I had the eighty per cent, I reduced it to forty-eight, and on the one and one-half ten-thousandth, where I had the sixty-six, I reduced it to thirty-seven. I did not run a test on the first one of two ten-thousandths, but on the second one I found I was using an excess cadmium of twenty-nine per cent.

I found I was getting better distribution and I was plating at a lower cost by loading the barrels heavier and lowering the amperage and plating for a longer time rather than to put it on there fast and let it go like that. In other words, I figured if I had ten or twenty thousand or forty thousand pieces in the load and plated for ten or twenty minutes and had four and one-half revolutions, I did not think there was anything that was going to make those forty thousand pieces all get some plating in twenty minutes. I figured that if I doubled the time and let them come around in the barrel and plate slowly, I would plate at low cost and better distribution.

* See Chart on Page 433 entitled "Is It Good Policy to Keep the Sq. Ft. of the Load Constant?"

WORK RECORD—MARCH 29, 1934 TO MAY 24, 1935

Date	Number of Pieces Plated	Sq. Ft. Surface Plated	Lbs. Plated	Hours †Labor	Lbs. Cadmium Used	Lbs. Cadmium Required for Sq. Ft. Plated	Lbs. Excess Cadmium for Reg. Thickness	Actual % Excess Cadmium Used. Thickness Reg.	Correct % Excess Cd. Used for Average Thickness. †250 Lb. Cd. Oxide Used	Lbs. Sodium Cyanide Used	Record of Changes and Improvements
3/29/34 to 5/18/34	3,896,469	74,775	69,064 lb.	429	850	386	464	120%	170%	625	No system—barrels loaded and run until all steel was covered with cadmium—only soak cleaner used 16 oz. gal. Solution 2 oz. Cd. 10 oz. Cn.
5/21-7/11	2,283,833	36,594	33,439 lb.	203	439½	183	256½	130%	130%	226	Additional tumble cleaner in open end barrel with solution 4-8 oz. gal. Also acid dip 75% HCL —10% HNO_3—15% —H_2O.
7/12-9/26	1,861,470	37,942	35,974 lb.	198¼	241	166½	74½	45%	45%	248	All work measured for area — plating time specified for average thickness load line on heavy work held as near as possible to center of barrel.
9/27-12/14	1,904,854	30,697	36,435 lb.	194	225½	146¼	79¼	54%	54%	68½	Load line on light gauge stampings from center to ¾ full. Solution changed to Cd. 2 oz. Cn. 8 oz.
12/17-3/1/35	5,803,438	109,172	109,362 lb.	611	624¾	587½	37¼	*6%	*39%	503	Amperage for all loads regardless of size 42″ bbl.—300 amp.—24″ bbl.—150 amp. Trial figure of 90% barrel efficiency used.
3/4-3/8	358,285	10,632	11,068 lb.	67¾	69	70	—1	—1.4%	32%	17	Trays for dumping work made with screen bottom. Separate tank installed to wash all plated work — rinse water saved.
3/11-3/15	148,475	5,198	6,561 lb.	42½	35	34	1	3%	36%	17	Anode rods attached to tanks. Ammeters repaired,
3/16-3/22	710,450	11,898	10,843 lb.	68	102	58	44	76%	40%	34	New formica panels in both barrels. Solution changed to Cd. 1¼ oz. Cn. 6 oz.
3/25-3/30	288,505	4,432	4,151 lb.	25	28½	20	8½	42½%	42½%	17	Amperage for all loads—42″ bbl.—250 amp.—24″ bbl.—125 amp. Ammeter reading watcher more closely.
4/1-4/5	457,055	8,846	7,954 lb.	49¾	55	41	14	34%	34%	17	Accurate plating time. Bbl. efficiency changed—100%-42″ bbl. 98%—24″ bbl.
4/8-4/12	565,920	11,173	8,926 lb.	56¾	53½	54	—½	—.9%	32%	17	
4/15-4/19	376,810	7,948	7,768 lb.	38½	72¾	43½	29¼	*67%	*31%	34	
4/22-4/26	1,042,370	12,442	11,551 lb.	67	85¼	67½	17¾	26%	26%	17	
4/27-5/3	453,345	6,886	6,415 lb.	38¾	50	44¾	5¼	12%	12%	27	
5/6-5/10	421,000	7,706	6,843 lb.	40½	43⅛	36½	6⅝	18%	18%	17	
5/13-5/17	429,560	7,514	7,218 lb.	39½	40¾	36½	4¼	12%	12%	47	
5/20-5/24	396,168	6,413	6,071 lb.	37½	46½	41	5½	13%	13%	17	
TOTAL	21,398,007	390,276	379,643 lb.	†2,206¾	3,062⅛ lb.					2,560½ lb.	

EQUIPMENT USED

1—42″ horizontal barrel.	1—24″ horizontal barrel.
150 gal. solution.	100 gal. solution.
150 lbs. anodes.	100 lbs. anodes.

Barrels have—negative connection each end—formica panels with 3/16 perforations—make 4½ rev. per minute.

* Experimental period.

† Includes cleaning work—load and unload bbls. and dry up work.

BARREL EFFICIENCY

Date of Experiment	Article	Per Load Pieces	Per Load Sq. Ft.	Average Amperes Used	Plating Time Minutes	Wt. of Load Before Plating	Wt. of Load After Plating	Wt. of Cadmium Deposited	Cd. Should Be Deposited at 100% Eff.	Bbl. Efficiency	Cadmium Solution	BBl.	Condition and Age of Bbl. Panels
12/10/34	1⅞ Hose Clamp	320	17.1	262½	60	18 lb. 8 oz.	19 lb. 9 oz.	1 lb 1 oz.	1 lb. 3.425 oz	87.9%	Cd. 2 oz. Cn. 8 oz.	42"	Well Worn 5 years old
12/12/34	# 38 Clip	2,385	59.3	280	120	29 lb. 13 oz.	30 lb. 15 oz.	1 lb 2 oz.	1 lb. 5 oz.	86%	Cd. 2 oz. Cn. 8 oz.	42"	Same
12/13/34	3/16 x 1¼ Bolt	18,127	203	422	60	189 lb. 5 oz.	192 lb. 11 oz	3 lb. 6 oz.	3 lb. 14.456 oz	86.4%	Cd. 2 oz. Cn. 8 oz.	42"	Same
4/30/35	3/16 x 1¼ Bolt	19,640	220	250	90	216 lb. 11 oz.	218 lb. 7 oz	28 oz.	27.75 oz.	100%	Cd. 1½ oz. Cn. 6 oz.	42"	New 6 months old
5/1/35	1⅞ Hose Clamp	843	45	250	60	32 lb.	33 lb. 2½ oz	18.5 oz.	18.5 oz.	100%	Cd. 1½ oz. Cn. 6 oz.	42"	New 6 Months
12/10/34	1⅞ Hose Clamp	312	16.7	118	60	18 lb.	18 lb. 10 oz	10 oz	8.732 oz.	114%	Cd. 2 oz. Cn. 9 oz.	24"	Well Worn 5 years old
12/14/34	3/16 x 1¼ Bolt	4,499	50.4	125	90	45 lb.	45 lb. 13 oz.	13 oz	13.875 oz	93.7%	Cd. 2 oz. Cn. 8 oz.	24"	Same
12/14/34	3/16 x 1¼ Bolt	4,499	50.4	125	90	45 lb.	45 lb. 13 oz	13 oz	13.875 oz.	93.7%	Cd. 2 oz. Cn. 8 oz.	24"	Same
12/18/34	1⅞ Hose Clamp	312	16.7	92	60	18 lb.	18 lb. 7 oz	7 oz	6.808 oz.	103%	Cd. 2 oz. Cn. 8 oz.	24"	Same
12/18/34	1⅞ Hose Clamp	173	9.3	96	60	10 lb.	10 lb. 7 oz.	7 oz	7.104 oz	100%	Cd. 2 oz. Cn. 8 oz.	24"	Same
4/30/35	1⅞ Hose Clamp	464	24	124	60	17 lb.	17 lb. 9 oz.	9 oz	9.176 oz	98%	Cd. 1½ oz. Cn. 6 oz.	24"	New 6 Months
5/1/35	3/16 x 1¼ Bolt	9,820	110	115	90	106 lb. 5 oz.	107 lb. 1½ oz.	12.5 oz.	12.8 oz	98%	Cd. 1½ oz. Cn. 6 oz.	24"	New 6 Months
						IS IT GOOD POLICY TO KEEP THE SQ. FT OF THE LOAD CONSTANT?							
3/5/35	Ring 1⅜	2,960	60	300	60	40 lb.	41 lb 8 oz	24 oz.	22.2 oz.	109%	Cd. 2 oz. Cn. 9 oz.	42"	New
3/5/35	Pin for Clevis	6,493	60	300	60	137 lb.	137 lb 8 oz	8 oz	22.2 oz.	36%	Cd. 2 oz. Cn. 9 oz.	42"	New
3/5/35	Ring 1⅜	1,480	30	155	60	20 lb.	20 lb. 12 oz	12 oz	11.4 oz.	105%	Cd. 2 oz. Cn. 9 oz.	24"	New
3/5/35	Pin for Clevis	3,247	30	150	60	68 lb. 8 oz	68 lb. 7 oz	7 oz	11.2 oz	62.5%	Cd. 2 oz. Cn. 9 oz.	24"	New

AVERAGE THICKNESS VS. MINIMUM THICKNESS

The following run in old barrel—with 33⅓ sq. ft. to each load. Average ampere 340—Bbl. Efficiency 86% Solution 2 oz. Cd. 9 oz. Cn.

Minutes Plating Time	Oz. Cadmium Deposited	Minimum Thickness Test	Oz. Cadmium Required for Average Thickness	Excess Cadmium Req. for Minimum Th Oz.	Excess Cadmium Req. for Minimum Th %
7	2.53	.00005	1.206	1.324	108%
12	4.33	.0001	2.41	1.92	79.7%
17	6.13	.00015	3.62	2.5138	65.9%

The following run in new barrel—with 45 sq. ft. each load. Average ampere 250—Bbl. Efficiency 100% Solution 1½ oz. Cd. 6 oz. Cn.

Minutes Plating Time	Oz. Cadmium Deposited	Minimum Thickness Test	Oz. Cadmium Required for Average Thickness	Excess Cadmium Req. for Minimum Th Oz.	Excess Cadmium Req. for Minimum Th %
9	2.7	.00005	1.62	1.08	66%
16	4.8	.0001	3.24	1.56	48%
22	6.6	.00015	4.86	1.74	37%
28	8.4	.0002	6.48	1.92	29%

For Better Distribution and Lower Cost Load Barrels Heavier; Lower Amperage; Plate Longer Time.

COST OF CLEANER—SODIUM CYANIDE—DRAG OUT

Sodium Cyanide Used				Drag Out from Cadmium Solution 2 Oz. Cd. 8 Oz. Cn.					Cleaner Used		
Solution	Lbs. Cadmium Used	Lbs. Sod. Cn. Used	Lbs. Sod. Cn. Required for Each Lb. Cd. Used	Parts Used for Test	Sq. Ft Surface in Test	Oz. Cadmium in Solution After Test	Oz. Sod. Cn. in Solution After Test	Cost of Drag Out Per Sq. Ft. Cd.-Cn.	Lbs. Cleaner Used at 10c Lb.	Sq. Ft. Surface Cleaned	Cost Per Sq. Ft. to Clean
2 oz. Cd. 8-10 oz. Cn.	1,529¾	1,045½	.683 lb.	1⅝ Clamp	250	3.5	10	$0.001	823	144,994	$0.00056
1½ oz. Cd. 6 oz. Cn.	659¾	278	.497 lb.	Bolts & Nuts	294	4.	15	0.00113			

Electroplating Generators

By CHARLES J. SCHWARZ
Electrical Designer, St. Louis, Mo.

A Series of Articles on the "Cornerstone of the Plating Plant". — Conclusion*

THE inductive magnetic system of a low voltage generator is stationary and consists of the following:

1. The magnetic frame.
2. The main poles and their windings.
3. The commutating poles and their windings.

The magnetic frame has two principal functions:

1. To support the main poles and the commutating poles.
2. To complete the magnetic circuit between the poles of opposite polarity.

This last function, important as it is, has, in the case of the large sized low voltage generators, been stressed more than necessary and in many instances at the expense of the first. For instance, in a 25,000 ampere-6 volt-120 r.p.m. generator having forty poles, an armature that is one hundred inches in diameter and a field frame that is one hundred twenty inches inside diameter, the necessary flux is obtained as follows: 40 poles times 5 bars gives 200 as the total number of bars. Each bar has two coil sides conducting the current in the slots and therefore there are four hundred conductors that are cutting the lines of flux at the rate of two rps. This means there are eight hundred interlinkages per second. These eight hundred interlinkages per second must be multiplied by 750,000 lines of flux to produce 600,000,000 ab-volts or 6 standard volts.

If we allow twenty per cent for leakage we will require a flux of 900,000 lines. This total flux will be divided into two paths in the field frame as is shown in Figure 1. Each path will therefore take one half or 450,000 lines.

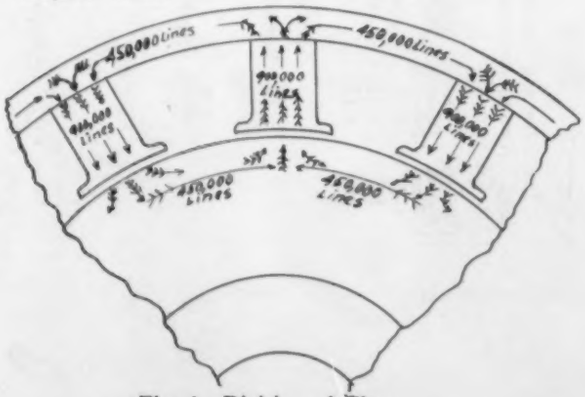


Fig. 1. Division of Flux

An ordinary grade of commercial steel will easily accommodate the passage of 100,000 lines of flux per a square inch of its cross-section. Therefore the cross-section of a frame to accommodate 450,000 lines of flux is four and one half square inches. This could be made of a band four and one half inches wide and one inch thick, a band six inches wide and three quarters inches thick or a band nine inches wide and one half an inch thick. Very obviously such a band having one hundred and twenty inches as its inside diameter would not even support its own weight rigidly, much less maintain its contour in a vertical position in a generator, supporting in addition the heavy field coils with their additional stresses due to any unbalanced magnetic pull while the generator is in operation. Due to the physical requirements alone a frame must be used that will be much larger than the magnetic requirements demand. Clearly, in this case the first mentioned function of a field frame will engage the attention of the designer. When he has laid out a field frame sufficiently rigid the magnetic permeability of the material will not be of much importance as the cross-section will necessarily be ample.

The field frame of large plating generators should be designated primarily for rigidity and it is not necessary to specify that it should be constructed of a material having the highest obtainable permeability. Of course in the case of small generators and even in some generators of moderate sizes, cast steel or fabricated steel may be quite properly selected as the material for the frame.

The main poles of the modern generator are almost invariably built up of a number of steel stampings held together by means of rivets. In direct current generators the reason for the laminated type of construction is usually the fact that it is the cheapest way to build a pole piece of uniform size, shape and quality. The pole shoe is generally stamped integral with the pole body and the combination of the pole shoe and pole body is called the pole piece lamination. A group of these laminations riveted together form the pole piece. The practice of annealing the pole piece laminations of a direct current generator is not general, and its advantage, in view of the cost of the operation, is doubtful.

The radial length of the pole piece lamination has an important bearing on the efficiency of the field system and the temperature rise in the field coils. Short radial length of the pole pieces necessarily demands the use of a short field coil winding. This limits the number of turns that can be wound on the coil and necessitates a higher current density in them

*Parts 1 to 8 were published in our issues for June, July, August, September, October and December, 1933; February 1934 and April, 1934.

to produce the required number of ampere turns. Consequently, a higher loss with less radiating surface for dissipating the heat generated is the result.

Compare, for instance, a pole piece five inches in radial length with one of ten inches. Allow in each case an inch for insulation in the back and in the front and for the space occupied by the pole shoe. This leaves four inches of active winding length in the first case compared to nine inches in the second case. See Figure 2.

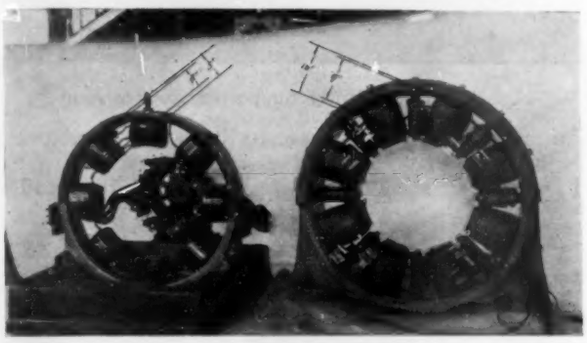


Fig. 2. Variation in Radial Length of Pole Pieces

Suppose we wind both pole pieces with a conductor of such size that we get ten turns per inch radial length of the core; then in one case we will have forty turns per layer and in the other case ninety turns per layer. If each coil consists of ten layers then the ratio of turns will be four hundred to nine hundred. If the cross-section of the pole pieces are the same, that is in width and thickness of the cores, then the mean length of turn of the both coils will be identical. Let us call the mean length of turn "L," then the total length of wire in the first case will be 400L in the first case and 900L in the second. Now let us give a resistance to the mean length of "L" of 0.01 ohm and then the resistance of the two windings will be four and nine ohms respectively. By Ohm's Law, if ten volts are impressed across each coil then a current of 10/4 or 2.5 amperes will flow in the first coil while a current of 10/9 or 1.11 amperes will flow in the second. Ten volts times the two and a half amperes will furnish us with the amount of power needed by the coil, namely twenty five watts, to provide 400 times two-and-a-half amperes or one thousand ampere turns. Ten volts times 1.11 amperes will furnish us with the amount of power needed by the second coil, namely 11.11 watts, to provide 900 turns 1.11 amperes or the same one thousand ampere turns. The longer radial length pole piece in this case provides the same number of ampere turns for less than half the expenditure of electrical energy in watts.

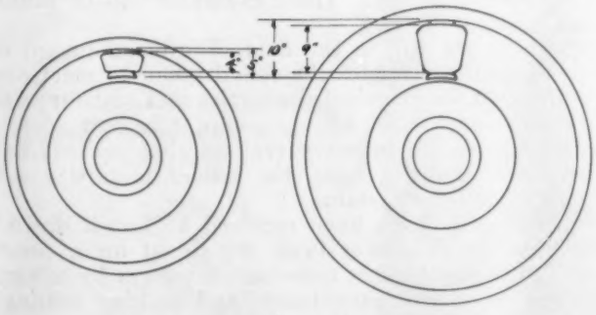


Fig. 3. Comparison of Air Spaces Between Poles

It is further seen in Figure 3 that the air space between the poles having the longer radial length is the same for the first five inches measured from the armature but is much greater for the remaining five inches to the frame. This, however, is not a clear gain of winding room because it has to be purchased at the expense of a (1) a pole piece twice as long, and therefore costing twice as much in material and somewhat more in labor; (2) by the use of a field frame 10" larger in diameter; (3) by the cost of the insulated copper wire in the proportion of nine pounds to four, and (4) the additional cost of labor and handling of the larger pole piece.

The commutating poles are generally made of commercial steel bars more or less rounded on the thin sides. Specifications calling for laminated commutating poles are rare and often disregarded by the manufacturer.

The dimensions of the commutating pole are figured from the armature calculations. The commutating poles and their windings are, so to speak, the stationary counterpart of the armature. Once connected properly to the armature by means of the brushes, that relation is correct whether the machine is operated as a motor or a generator.

The number of turns wound around the commutating pole bears a definite ratio to the windings of the armature and the current that will flow through these turns also bears a definite ratio to the output of the armature in amperes.

Therefore, for the commutating pole as well as for the main pole, the radial length is of importance because, by permitting the use of a larger cross-section of conductor for the necessary number of turns called for by the armature winding, the copper loss and the consequent heating can be kept down.

While it would be possible to build a generator having radially long pole pieces and at the same time low efficiency, generally long pole pieces are an excellent index of a generator of high efficiency and of low temperature rise.

A difficulty with the radially long pole pieces and commutating poles is that the slightest irregularity in machining or a very small chip or piece of dirt under the face of the pole where it is attached to the frame, will throw its internal face more or less out of its proper position so that the center between the horns of the pole shoes and the armature end of the commutating poles is not exactly half way between the horns of two pole pieces.

Figure 4 shows an effective manner of locating the

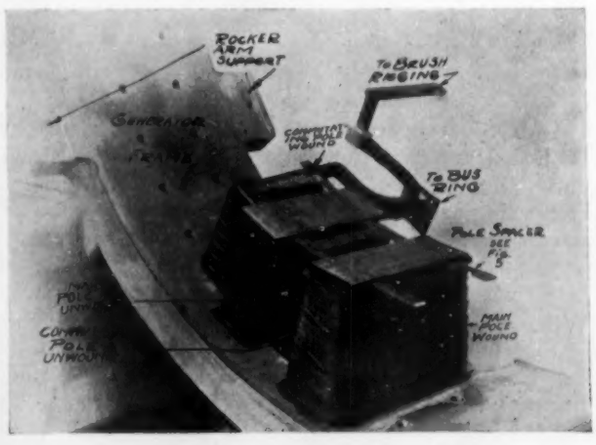


Fig. 4. Effective Location of the Internal Face of the Commutating Pole

commutating pole's internal face so that it is always exactly midway between two main poles. To that effect the horns of the pole shoe of the main poles are punched so as to have a wedge-shaped notch. A piece of bronze of the shape shown in Figure 5 is accurately milled so that its two ends engage the wedge-shaped notch in the horns while the central

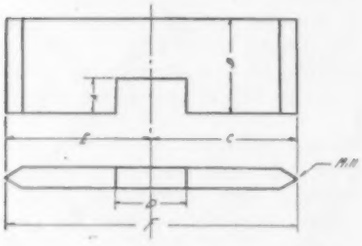


Fig. 5. Fixture for Locating Commutating Poles

square notch engages the commutating pole piece itself and insures perfect and permanent distribution of the flux from the main and the commutating poles to the armature.

Rocker Arm

Sometimes the field ring serves to support the rocker arm as shown in Figure 6; but not always, as

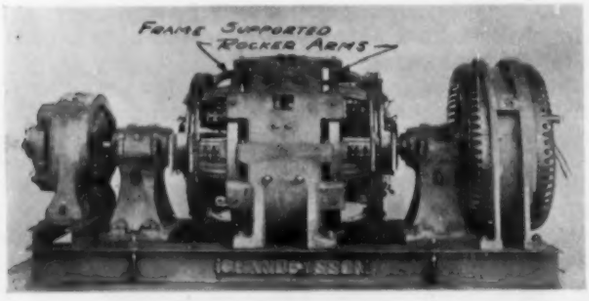


Fig. 6. Field Ring Supports Rocker Arm

will be seen in Figure 7 where the brush rigging and bus rings are supported by a separate support totally independent of the field game.

There has been considerable difference of opinion as to which is the best method and that in the writer's

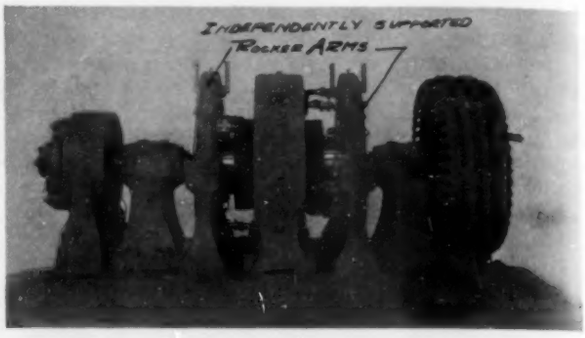


Fig. 7. Independently Supported Rocker Arm

opinion is a matter of taste as both are excellent if they are properly executed.

Figure 8 is shown for the benefit of the readers

Fig. 8. Motor-Generator Assembly

1. Exciter Frame; 2. Exciter Armature; 3. Oil Rings; 4. Babbitt Bearing; 5. Brushes on the Generator; 6. Pedestal; 7. Generator Field Frame; 8. Generator Armature; 9. Generator Commutator; 10. Generator Bus Ring; 11. Generator Brush Rigging; 12. Synchronous Motor Rotor (containing the field coils); 13. Synchronous Motor Slip Rings; 14. Synchronous Motor Stator; 15. Motor-Generator-Exciter Base.

who are not very familiar with the motor generator assembly. It is self explanatory.

Faith in the Future of the Brass Foundry

By SAMUEL FRANKEL
H. Kramer & Company

ALMOST everyone connected with foundries has heard at some time that the industry is slowly dying. Substitutes for castings—new materials—fabricated parts—new developments—are cited as proof that castings will soon be seen only in museums. The most amazing part of this condition is that occasionally we meet foundrymen who **really feel** this way.

When Gillette invented the safety razor everyone said that barber shops would soon be a thing of the past. Today, many years after this prediction, there are more barber shops than existed at that time. Another example is the bicycle. Production is going on at a greater pace than at any other time in its history. This means a new era of falling over bicycles in the front hallway. These examples can be multiplied.

Castings are still in the field. The development of new alloys now enables the foundryman to meet any specification for physical properties and resistance to corrosion—and above all—to compete in cost.

The sooner the industry realizes that present day business is really a **fight**, the sooner foundries will regain their former status.

The foundry may have received a "knock down." But hasn't that always been the signal for a comeback? Let's make that comeback a winner by talking castings at every opportunity, and making castings that exceed the desired specifications.

It can be done.

The London Electrodeposition Exhibition

By DR. S. WERNICKE
London, England

AN EXHIBITION covering all branches of Electrodeposition has been open to the public during the months July-October at the Science Museum, South Kensington, London. It marks an important stage in the progress of this branch of electrochemical work in Great Britain. While it is the first public Exhibition which is devoted purely to electrodeposition in all its phases, it is actually the third, although certainly the most ambitious attempt on the part of the Electrodepositors' Technical Society to interest technologists and laymen alike in the work of the electroplater by bringing together examples of the products of the industry and demonstrating the developments in the control of operations, quality of the deposit and speed of production for which the electro-chemist has been mainly responsible.

Demonstration of Principles

The principles of electrodeposition are demonstrated by means of diagrams and actual working models. An interesting model shows the process of plating first with copper then with nickel, an ingenious apparatus having been devised in which a small strip of metal travelling in a cycle is alternately immersed in the two plating solutions with intermediate washings. The chemicals used in the preparation of all the metals commonly plated are set out and examples of practically every known deposit are shown.

Research Exhibit

One of the largest stands is devoted to a great number of exhibits, diagrams and charts which demonstrate in an extremely lucid manner the intensive research work which has been carried out in evaluating the physical properties of deposit. These include the thickness, porosity, adhesion, hardness and corrosion resistance of the electrodeposit while other important factors comprise its stress condition, presence of pitting, cracking, etc.

Electroplating Plant

A comprehensive exhibit is that devoted to up-to-date plant, both models and full sized units being shown.

A model fully automatic plating plant is exhibited which is an exact reproduction of modern equipment which is reduced to one-tenth full scale; it represents a real plant about 100 ft. in length. The work is conveyed in turn through (1) an iron tank containing the boiling cleaning solution, (2) a wooden lead-lined tank holding clean running water, (3) a cyanide dip in an iron tank, (4) another water swill, (5) an acid dip in a lead-lined tank, (6) a further swill, (7) the nickel tank, (8) a water swill and (9) finally a tank of hot water. The nickel tank is a lengthy one, corresponding to the time of plating. The actual nickel vat represented by the model holds approximately 3,000 gallons, the work taking some thirty to forty minutes to pass through it; this time at the current density employed results in the deposition of 1,000th of an inch of nickel on the parts plated.

A typical nickel and chromium plating outfit reduced in scale to one-third is also shown, the nickel tank being of wood lined with chemical lead and plate glass to prevent any short circuiting currents through the lead lining. The tank is fitted with a system of cathode rod movement, the solution being aerated from a compressor and is kept dust free by a filtering system; waste steam passes through a lead pipe in the solution to maintain the necessary temperature of the electrolyte. The chromium plating tank is of welded mild steel lined with 6% antimonial lead and plate glass. A typical feature of chrome plant is the attachment of a draughting system which

Exhibition of Electrodeposition at South Kensington, London, England

draws a rapid stream of air above the solution carrying the chromic acid spray through ducts into a tank where the electrolyte is condensed. This equipment is necessary to fulfil British Home Office regulations.

Full-size motor generator sets are on view, one of which is working continuously supplying current to other exhibits. This method of producing the high currents at low voltages required in the plating shop is however being seriously challenged today by metal rectifier units, which are compact and highly efficient; a 6 volt 500 amp. rectifier unit is on view, as an example of this recent development. Plant for polishing and cleaning metals prior to plating, the latter including the solvent vapor degreaser type of apparatus, is shown as well as different types of plating barrels used in plating small articles on a mass production scale, and the essential electrical instruments used in exercising control over operations.

Electroplating Exhibits

The exhibits illustrating the use of plated finishes are of most direct appeal to the public which makes daily use of the most diverse articles which have passed through the hands of the electroplater. The common platings are shown by typical applications in which they are used—thus, the ubiquitous chrome finish is exemplified on motor-car fittings while a modern bath-room completely fitted with chromium plated taps, towel rails, etc. exemplifies the use of this finish for sanitary purposes.

The use of zinc and cadmium plating primarily as a protective but also for decorative purposes is effectively brought out on such equipment as telephone apparatus and wireless receiver parts.

A typical example of tin plating is its use on articles which come into contact with foodstuffs. Tin plated refrigerator parts exemplify this application.

Copper plating was well represented by a number of bronze finishes. Some excellent examples of the coloring of metals comprise a separate exhibit.

Lead plating is exemplified by some sections of girders and also locomotive springs on which this finish is now being increasingly used.

Precious Metals Plating Exhibit

Two cases in this Exhibition are devoted to one of the most recent developments in electrodeposition work—the plating of the precious metals platinum, palladium and rhodium. These finishes have only become commercially possible during the last two or three years, and there is a little doubt that a considerable future for these metal deposits lies ahead.

Electroforming

This section of the Exhibition deals with diverse products which are actually made or "grown" by electrodeposition. Electrotyping comprises the largest branch of this type of work and several examples of photogravure printing cylinders, many of which are faced with a chromium deposit to provide the maximum of wear in printing, are on view. Another important industry is concerned with the production of gramophone records. A very interesting section of this series of exhibits is devoted to beautiful reproduction of metal objects of art, plaques, etc.

"Building up" of Worn Parts

A series of exhibits of special interest to engineers represents the production of comparatively thick deposits which are used in the building up of worn or undersized metal parts. It was the necessity of salvaging such worn parts during the War which inspired this development. Today, the process is largely used in the repair of parts of road transport vehicles, engine parts, etc. While the order of thickness of deposit in plating work is about 0.001 inch, thicknesses up to one-quarter of an inch may be required.

Anodic Processes

In recent years some important industrial applications have been developed which centre round electrolytic phenomena which occur in the neghborhood of the **anode.** Such processes are termed anodic processes. The two most important applications are the electrodeposition of rubber and the anodic oxidation of aluminum and its alloys.

Electrodeposition of Rubber.—Rubber latex is a negative colloidal dispersion, i.e., it consists of a dispersion of very minute rubber globules which are negatively charged. When an electric current is passed, the rubber globules migrate to the anode. In 1908 the first patent was taken out for the continuous separation of rubber from latex by electrodeposition on a moving anode. This was first produced in an amorphous form, but later the possibility of producing shaped articles directly from the latex on a suitable anode was realized.

The case devoted to rubber deposition is full of interesting objects, including lined sheets, tubes, wire mesh and formed articles of which the most interesting is a perforated ladies' corset—a type of application which may prove quite important in the future.

Anodic Oxidation of Aluminum.—Two cases are devoted to a most interesting presentation of anodic oxidation of aluminum which indicates that considerable progress has been made in this comparatively new industry. The anodic film, largely aluminum oxide, which possesses very remarkable properties each of which opens up new applications. Briefly, the film is highly absorbent and possesses mordanting properties; it may therefore be colored by immersion in dyes or be efficiently "fixed" by impregnation of organic material. It is also electrically insulating, possesses good radiation and reflectivity properties, possesses considerable hardness and high corrosion resistance.

Two processes are exemplified based respectively on chromic and sulphuric acid electrolytes.

Specimens of the oxide film which have been separated from the basis metal by a special method are also shown. The method is based on the affinity of mercury for aluminum, a freshly exposed surface in contact with the mercury resulting in the undermining and eventual detachment of the oxide film in the form of small flakes. Thereafter it can be examined under the microscope. Some of these detached flakes are seen to have curled as a result of dehydration. Colored as well as non-colored films are exhibited.

Electrolytic Extraction and Refining of Metals

One of the most important exhibits which takes up practically the whole of one side of the hall covers the electrolytic extraction and refining of metals. Here examples are shown of almost every metal which is refined electrolytically at present, while photographs of the plant used, flow charts and models of cells provide an insight into the mechanism of some of the processes operated. Actual cathodes of most of the metals are shown, the following comprising some of the metals dealt with: aluminum, magnesium, beryllium, calcium, copper, nickel, zinc, cadmium, bismuth, lead, silver and the precious metals.

Sheet Metal as Used by an Artist

THE popularity of metal in architectural and decorative uses during the past few years has led a number of artists and designers to the use of metal for wall decorations. Edna B. Lewis, a young artist from Baltimore, in a recent exhibition at the Decorators' Club, 745—5th Ave., New York, showed metals assembled in various ways to produce unusual wall panels, screen and murals.

The metals used by this artist are copper, brass and aluminum. The design, after being worked out in detail on paper, is traced lightly on the sheet metal, which is then hammered and pressed by hand, working from both sides, to bring the design into relief.

On copper panels, various chemicals are used to produce light and dark hues and also to produce variations in texture. With both brass and aluminum, enamels may be used on the metal to add color where needed. In some instances, Miss Lewis combines other materials with the metal, such as cork or oilcloth, either as mats or backgrounds.

Aluminum is, of course, the metal most adaptable to the modern trend and a number of the panels make use of this metal. Two or three metals can sometimes be combined to produce unusually interesting effects, as illustrated in some of the panels. In the one shown here, aluminum, copper and brass were all used in various parts of the figures and inlaid in a cork background.

Panels and murals of metal can be used in a great variety of interiors. Many of the copper or brass panels would be suitable for use in a man's office, study or den where dark woods are used as well as in many wood-paneled offices.

Aluminum panels are effective in modern interiors where glass and chrome furnishings are used, such as bars, game rooms and offices. As a means of decoration in the offices of those concerned with metal manufacture, nothing could be more appropriate than panels of this type.

Mural Made of Aluminum, Brass and Copper

Marking Articles Made of Silver in Combination With Gold*

IN THE last two years repeated objections have been voiced as to the unfairness of the mark "10K and Sterling" or "10K on Sterling" when used on articles of sterling completely covered with gold or when the two metals are not distinguishable one from the other, because the mark is indeterminate, gives no clue to the relative proportion of the two metals and is therefore misleading and subject to abuse. In an effort to remedy the situation in the interests of the consumers and fair trade, the Jewelers' Vigilance Committee requested the cooperation of the Bureau in establishing a commercial standard for silver and gold combinations.

The resulting commercial standard, CS51-35, as now accepted by producers, distributors, and users, provides: That for articles completely covered with gold or where the two metals are not readily distinguishable one from the other, quality marks shall be recognized only when the ratio of gold to silver is 1/20th or more; that quality marks shall not be applied to articles of this description containing gold of less than 10-karat fineness; and that the proportion of the weight of the alloyed gold to the weight of the entire metal shall be included where quality marks are applied and the two metals are not visually separable and easily distinguishable one from the otner, for example, "Sterling+1/5 10K." Quality marks are to be applied so that the karat mark and its fractional prefix shall follow directly the "Sterling" mark, except when the fraction prefix is ½, the karat mark may directly precede the sterling mark. Where the two metals are visually separable and easily distinguishable, articles may carry a quality mark "Sterling," followed by the karat fineness of the gold, i. e., "Sterling+10K."

The commercial standard also lists the exemptions regularly recognized in the trade such as screws, catches, springs, etc.; includes the requirement that all quality marks must be accompanied by the manufacturer's name or registered trade mark as a means for determining responsibility for the quality marks; permits the use of class, pattern, or style marks, and suggests the wording of certificates and tags or other labels indicating to the buyer that the item is marked in strict accordance with the commercial standard.

The standard became effective for new production on July 1, 1935, and is effective for clearance of existing, on July 1, 1936. Copies are obtainable from the Superintendent of Documents, United States Government Printing Office, Washington, D. C., at 5 cents each.

* From the Technical News Bulletin of the National Bureau of Standards, October, 1935.

EDITORIALS

Plating Business Hazards

AT A recent meeting of the Master Electro-Platers of the Midwest, a paper by Carl Heussner of the Chrysler Corporation, was read, which described some of the hazards of the plating industry. Wisely, Mr. Heussner spent little time on the physical hazards which are well understood, but dwelt on the business hazards which are not yet properly appreciated by the industry as a whole.

There are two outstanding enemies of the plating industry.

1. Poor management due to ignorance, carelessness or short-sightedness, resulting in poor work which gives the industry a bad name.

2. Competing materials and processes which tend to replace plating.

What are the signs of Hazard No. 1? One of the foremost is a dirty shop. Among the essential factors in the production of quality plate are clean walls and floors, clean plating baths and rinses, clean, tight electrical contacts, good light and ventilation. These factors are all within the control of the plating shop superintendent or owner.

But what of Hazard No. 2, which is not wholly within the control of the plating industry? A new alloy like stainless steel or a new product like molded plastics may replace plated metal in a large number of instances. For example, at the recent Automobile Show in New York, plated surfaces were much less in evidence than several years ago, having been replaced by lacquers, enamels and stainless steel for such parts as radiator shells, hub caps, trim, etc. To be sure the die cast radiator grille calls for plate, but who knows how long the grille will continue to be die cast, or to be used at all, in the light of the rapidly changing styles in automobile design?

Against this hazard, which has and always will be present, there is only one defense—the best possible quality for the present types of plate and the constant development of new plates. In other words, the situation reverts to the plating industry.

In the long run the future of the electroplating industry depends upon itself. Fashions will change, but good products kept up-to-date will never lose their appeal. To repeat Mr. Heussner's words, "Every job plater is responsible to the industry as well as to himself. He is either helping to wreck it or to make it safe for the future."

Business Continues to Improve

THE general improvement in business activity which has been apparent for the past four months, continued through October and the first half of November according to the National Industrial Conference Board and the Federal Reserve Bank of New York. Automobile production, machine tool orders, building and engineering contracts, electric power output, rail shipments and others recorded more than seasonal increases. Machine tool orders were 134 per cent greater, residential building 109 per cent greater and automobile production 91 per cent greater than in October, 1934.

The improvement in corporation profits (as evidenced in the reports published in our business pages for the past few months) has resulted in the sustained advance in the prices of common stocks. Excess banking reserves reached a record high level of over $3,000,000,000 on November 13, and the flow of gold from abroad into the United States seems to indicate the soundness of our currency—or the greater unsoundness of others!

The optimism prevailing at this time is probably caused by the fact that the business improvement is well distributed over many parts of our national activities. Nevertheless, it is the fact that we are still in the woods, even though we seem to be getting nearer to the edge. Unemployment which has decreased by almost a million since last year, is still at the tremendous total of about 9,200,000, according to the National Industrial Conference Board. Railroads have not yet shared in the recovery to any great extent, the profits of Class I railroads during the first 9 months of 1935 being more than 6 per cent less than for the corresponding period of 1934. The heavy industries are improving, but the seemingly rapid rate is due to the very low state of their business a year ago. They are still operating below profitable levels.

We seem to be turning the corner but we are not yet all the way around it.

Occupational Disease Insurance

EMPLOYERS in New York State have been thrown into turmoil by a recently passed revision of the State law affecting workmen's compensation. The new regulations include all occupational diseases among compensable hazards. Since this is a new type of risk, upon which no reliable statistics are yet available, the private insurance companies have refused to write such policies, forcing employers to insure with the New York State Fund. The State Insurance Board is also at sea about the risks involved so it has increased its rates as much as 200 per cent in some instances.

The excuse for the almost vertical rise in rates is the fact that the insurer will be responsible for all cases of silicosis or other occupational diseases as they become apparent from now on, but which may have been contracted some time in the past. New employees are now, of course, being x-rayed before they are hired, but as old employees have never been examined they may have incipient silicosis, for example, which is sure to become apparent in time. As one insurance executive phrased it, "Insuring men against all occupational diseases which may appear is like insuring a house after a fire has started."

Two of our industries have been severely hurt, foundries and metal finishing plants. Foundries are obviously under suspicion of a high silicosis hazard. Workers in metal finishing shops are said to be in danger of silicosis from polishing operations and in addition, subject to attack by the fumes of chromic acid.

The risk of silicosis in metal finishing operations, according to opinions of qualified specialists, is small. The majority of the commonly used buffing compounds contain only negligible amounts of free silica. In this class of materials are rouge, pumice, lime and such abrasives as alundum or carborundum. Tripoli consists to a large extent of silica but it is usually mixed with grease or stearic acid and when used on a wheel provided with an exhaust hood, the hazard is not great. There is little if any dust from the composition, most of the dust in polishing operations coming from the wheel.

Of the unwisdom of loading such a burden on industry all at once, there is no need to speak at length. With base rates now ranging from 4.1 per cent to 8.2 per cent for plating shops, from about 7 per cent to over 11 per cent for brass foundries (and as high as 18 per cent for stone cutting for example), New York State manufacturers are becoming actively interested in factory space and property in New Jersey and Connecticut. Amendments to the laws will be presented at the next session of the legislature and we can only hope that the manufacturer, who pays the piper, will be allowed a reasonable voice in calling the tune.

We have no quarrel with the principle that men who are injured or become diseased through their occupations should be compensated. That is simple humanity. But we do marvel at a plan which imposes such heavy burdens in such haste as to make competition with bordering states possible. The plan may be honestly conceived, but it is so unwise in detail and so inept in its methods of application that it spells ruin for New York State industries.

The New Canadian Trade Agreement

THE new trade agreement with Canada seems to have drawn a mixed fire of comments, the opinions of the commentators varying directly as their interests have been affected. It is, however, an important step in the direction of the lowering of trade barriers to facilitate greater exchange between nations at a time when higher and higher tariff walls seem to be the rule.

The United States has reduced tariffs on a number of raw material and agricultural products in exchange for reductions on many manufactured items. These manufactured items include a considerable number of non-ferrous metals and their products, and also manufacturing equipment and machinery. Machinery manufacturers view this agreement favorably, according to John W. O'Leary, president of the Machinery and Allied Products Institute.

As in all experimental steps, only time will show whether it is good, bad or indifferent for the country as a whole. It will undoubtedly be watched by the sharpest eyes.

The Social Security Act

BEGINNING January 1, 1936, the Social Security Act, signed by the President on August 14, goes into effect. Its first consequence is a tax on employers.

The act is composed essentially of two parts: (1) Unemployment Insurance and (2) Old Age Benefits or Pensions.

For Unemployment Insurance, taxes upon employers with eight or more employees, (this number may vary in different states) begin to accrue on January 1st, 1936, at the rate of 1 per cent of the total payroll; in 1937, the tax is 2 per cent; in 1938 and thereafter, 3 per cent. If a state has a similar law, the employer may deduct his contributions to the state from the Federal tax, up to 90 per cent of the Federal tax. In other words, in New York for example, if an employer is liable for $100 each to the state and the Federal governments, he will pay $100 to the state and $10.00 to the Federal Government. The employee pays nothing toward this fund. Benefits to employees begin in January, 1942.

For Old Age Benefits, the taxes begin in 1937. The employer pays 1 per cent of his payroll in 1937, 1938 and 1939; 1½ per cent in 1940, 1941 and 1942; 2 per cent in 1943, 1944 and 1945; 2½ per cent in 1946, 1947 and 1948; 3 per cent in 1949 and thereafter. This tax is not deductible from income in computing income taxes. The employees pay the same rate on their wages. Their tax must be collected by the employer and remitted to the Government together with his own. Benefits to employees begin in January, 1938.

The prospect immediately before employers is 1 per cent tax on payrolls beginning January, 1936. This will be increased year by year to an eventual total of over 6 per cent.

New Books

Finishing Metal Products, by Herbert R. Simonds. Published by McGraw-Hill Book Company. Size 6 x 9; 337 pages, illustrated. Price $3.50.*

There are literally dozens of books on metal finishing in its many respects, but it is safe to say none like this one. All of the others, practical, technical or scientific, are written for the man in the shop or plant, the foreman, chemist or metallurgist. Finishing Metal Products tells its story to the executive, the official or the works manager. It does not attempt to be a technical reference work. Its descriptions of finishes tell briefly what they consist of, how applied, their properties, advantages and disadvantages and their comparative costs; but all from the point of view of the manufacturer who has a product to sell and must make a profit.

The area covered by the book is necessarily broad because of the diversity of the field. It includes the commercial aspects of finish and appearance; the preparation of metal products for finishing operations; mechanical treatment, such as buffing and polishing; electroplating; spraying; hot dip galvanizing; vapor coating (sherardizing); painting; aluminum coloring; vitreous or porcelain enameling; lacquers; special and "novelty" coatings. These subjects are described in sufficient detail to show the manufacturer how finishes are produced and what such departments mean in his plant.

That the subject needs treatment in this fashion has become increasingly clear during the past decade. In spite of the increased use of stainless alloys, which were supposed at one time to replace electroplates, the application of plates and special finishes on cheap base metals, has grown steadily, partly because an attractive finish aids the sale of a product and partly because a sufficiently long life of a product can be obtained at low cost if the protective coating is heavy enough and properly applied.

The book presents information to help answer such questions as:

What does this finish cost?
Are my present finishing costs in line with good practice?
How can savings be effected?
Is my finishing machinery up-to-date?
Can the layout be improved?

Mr. Simonds makes a brave attempt to estimate the statistics of an industry in which they are famous for their absence. The last part of Chapter I presents some very interesting estimates, to give the reader an idea of the extent of the industry. Very roughly, metal finishing in all its ramifications may be estimated at over $500,000,000 per year. Obviously the industry is large enough to deserve more attention than it has had in the past.

Chapter III on Plating Characteristics is another step into new territory—a systematic, practical basis for the selection of the proper finish for a manufactured article. This chapter deserves to be used as the basis or starting point for a really extensive survey to cover the entire field. Not that such a job would be short or simple. Even the $500,000,000 total given above does not cover it. Broad as Mr. Simonds' book is, it does not include the various colors and chemical finishes on brass and copper, the jewelry finishes, such as gold in its many varieties, platinum, palladium, rhodium, and last but far from least, plated silver flatware and hollow ware. This is in no sense of the word a complaint that the book is incomplete. It is only additional evidence that the size of the industry, its ramifications, its possibilities and its problems have not yet been generally appreciated.

Mr. Simonds has done a valuable and stimulating piece of work.

* From Mining & Metallurgy, December.

Principles of Metallography, by Dr. R. S. Williams and Dr. Victor O. Homerberg. Published by McGraw-Hill Book Company. Size 5½ x 8; 313 pages. Price $3.50.

The fundamentals of physical metallurgy; an introduction into larger and more specialized works. This is the third edition, to a large extent re-written and re-arranged, and a discussion of corrosion has been added.

Metallography and Heat Treatment of Iron and Steel, by Albert Saveur. Published by Albert Saveur, printed by The University Press, Cambridge, Mass. and marketed by McGraw-Hill Book Company. Size 7¼ x 10½; 531 pages. Price $8.

The fourth edition (19th thousand) of this classic work. New chapters have been added: Chapter I on Metallic Crystals and Their Atomic Structures, and Chapter XVIII entitled A Simplified View of the Hardening of Steel, of the Transition Constituents and of the Microstructure of Steel. Nearly every chapter has been revised to some extent and some, quite extensively.

Technical Publications

Purification of Gallium by Fractional Crystallization of the Metal. Research Paper RP823. National Bureau of Standards, Washington, D. C.

The Functions of a Technical Information Bureau. Miscellaneous Publications No. 3, of the International Tin Research and Development Council, 149 Broadway, New York.

Solder. Bulletin No. 2 of the International Tin Research and Development Council, 149 Broadway, New York. The contents include Historical Note; Methods of Soft Soldering; Soldering Machines for Cans and Boxes; Solder in the Development and Manufacture of the Internal-Combustion Engine Radiator; Soldered Joints in Automatic Telephone Exchanges; General Uses of Solder; Bibliography on Solders and Soldering.

Committee Reports of the American Society for Testing Materials:

Report of Committee D-14 on Screen Wire Cloth. Price 35c.

Report of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys. Price 50c.

Report of Committee B-6 on Die Cast Metals and Alloys. Price 75c.

Report of Committee A-5 on Iron and Steel; includes proposed tentative specifications for electrodeposited coatings of zinc on steel; cadmium on steel; nickel and chromium on steel. Price 50c.

Obtainable from the American Society for Testing Materials, 260 S. Broad Street, Philadelphia, Pa.

Government Publications

Resubmission Proposed Federal Specification for Valves, Bronze; Globe, Angle and Cross, (for land use). Comments or criticisms, which are invited, must be received by the Federal Specifications Division, Room 751, Federal Warehouse, 9th & D Sts., S. W., Washington, D. C. by December 5, 1935.

Interim Report. Power Series No. 1 of the National Power Survey made by the Federal Power Commission. For sale by the Superintendent of Documents, Washington, D. C. Price 75 cents.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Bluing Steel

Q.—In view of the fact that I have been required to give a blue finish to some articles and especially in fire arms, I would appreciate information concerning this process.

A.—A gun metal blue may be obtained in a nitre bath. This bath is made up of heating equal parts of sodium and potassium nitrate in a cast iron or steel pot to 900 deg. F. and manganese added in the ratio of about 1 part oxide to 50 parts nitre. Mixing pot should be free from rust and dirt.

The articles to be colored are first cleaned, then given a thin coating of oil, then immersed in the hot nitre at 600 deg. F.—650 deg. F. Leave articles in bath till they reach desired color. Rinse in cold water, then boiling hot water and finally in hot oil. A darker gun metal blue may be obtained by heating to 1000 deg. F. A black or gun metal finish may be obtained on steel articles by heating them in a retort with a small amount of charred bone and heated to 700 deg. F.—800 deg. F. After articles are thoroughly oxidized temperature is dropped to 650 deg. F. and a mixture of bone and carbonia oil is added. Several hours are required to produce finish.

Articles, after coming from retort, are rolled in oily granulated cork until uniform black finish is secured. Parts to be colored should have good surface finish.

T. H. C., Problem 5,443.

Brittle Nickel Solutions

Q.—Sample of bright nickel solution for analysis. Deposit is too hard and brittle. Have been using cadmium sticks as brightener. Plating German silver cabinet keys.

A.—The analysis of your solution is as follows:—

Nickel	2.23 ozs./gal.
Chloride, as ammon. chloride	1.0 ozs./gal.
pH	6.8

The worst feature here is the high pH which is probably the source of most of your trouble. In addition, the metal is somewhat low and the chloride the same.

Add 4 ozs./gal. of single nickel salts, 2 ozs./gal. of ammonium chloride, 1 oz./gal. of boric acid, and ½ pint of sulfuric acid per 100 gallons.

The use of cadmium as a brightener requires caution and judgment will have to be exercised as to the amount to use or the length of time to leave the stick on the anode rod. The correct amount of cadmium will produce a bright deposit. When excess cadmium is present the deposit will become dull again, and beyond that the deposit will be streaky and show dark colored spots. When the pH of the above solution is lowered by adding acid, excess cadmium may be brought back into solution from the mud. If this occurs work out the excess using dummy cathodes until desired results are obtained. The pH should be checked after this operation.

G. B. H., Jr., Problem 5,444.

Deficient Nickel Solution

Q.—We are sending you by today's parcel post a six ounce bottle of nickel solution for your analysis and would be pleased to have you give us any corrections to this solution that would be of benefit to us.

Solution does not produce proper color at voltages of 1½-2 but seems to burn easily and is hard to buff to brilliancy.

Solution always used cold at room temperature in southern climate average 78-85 deg.

A.—Analysis of solution:—

Nickel	1.8 ozs./gal.
Chloride, as ammon. chloride	1.74 ozs./gal.
pH	6.4

Nickel and chloride are low, pH is high. Add 6 ozs./gal. single nickel salts, 1¼ ozs./gal. of ammonium chloride, 2½ ozs./gal. of boric acid, and to each 100 gallons of solution add 1¼ fluid ounces of sulfuric acid.

G. B. H., Jr., Problem 5,445.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date.....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.: .....**Cathode surface, sq. ft.:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

Etching Resist

A.—Kindly give me a good resist for protecting aluminum from the action of an etching bath; also method of mixing, applying and also a method of removing same. Are there any commercially prepared resists on the market? How could I clean sandblast aluminum after highlights have been buffed of tripoli without etching of bright finish?

A.—In applying resist to any metal previous to etching, the method to be employed is dependent upon the intricacy of the design desired. For fine lines and small cross section design, etching resist can be applied readily by transfer printing with a steel die. By using the lithograph or offset method of printing, etching resist for all styles of design can be applied to metal. Etching resist can be applied by hand with a brush by one so skilled.

The etching resist used in printing methods mentioned are acid resisting inks, usually with a varnish base. These can be obtained commercially from any concern dealing in offset inks. These same inks can be used for hand application providing they are thinned down to proper consistency with turpentine. In hand application a very thin coat is desirable.

After resist has been applied it is necessary to dust with a mixture of 50% Dragon's Blood and 50% powdered rosin, and bake for at least 15 minutes at 250 deg. F. Wipe excess off with cotton before baking.

Resist can be readily removed with lacquer or cleaner thinner.

It is possible by using an organic solvent such as carbon tetrachloride to clean aluminum without affecting bright finish. Any number of commercial cleaners are available which will clean work of tripoli without injurying finish.

T. H. C., Problem 5,446.

Etching Stainless Steel

Q.—We are anxious to know what mixture of acids is used for etching on stainless steel.

A.—A number of solutions are used for etching stainless steel. It is assumed from your question that fairly deep etching is wanted. The following solutions can be used for stainless stain etching:

1.	Nitric acid	32 ozs.
	Hydrochloric acid	3 ozs.
	Denatured alcohol	16 ozs.
	Water	96 ozs.

Solution used cold.

2.	Ferric chloride	20 grs.
	Hydrochloric acid	20 grs.
	Water	60 cc.

This solution may be used warm at 120 deg. F. or electrolytically.

T. H. C., Problem 5,447.

Nickel, Cadmium and Silver Solutions

Q.—I am sending you a cadmium solution for analysis. After plating work spots up in a short time. I am sending also a nickel solution for analysis; also silver and bronze.

A.—Nickel solution as analyzed:—

Nickel	1.0 ozs./gal.
Chloride, as ammon. chloride	2.4 ozs./gal.
pH	6.8

Bring the nickel and chloride up by adding 9.5 ozs./gal. of single salts and ½ oz./gal. of ammonium chloride. Correct the pH by adding 5.1 ounces per 100 gallons of sulfuric acid. Add the acid slowly and over a period of three or four days. If pitting occurs add hydrogen peroxide. The pH should be checked after making the above corrections, and brought to the proper value of 5.8 to 6.0.

Silver solution:—

Silver	3.2 tr. ozs./gal.
Free cyanide	.3 oz./gal.

Cyanide is too low. Add 3 ozs./gal. of sodium cyanide. If a soft easily colored silver deposit is desired use potassium cyanide instead of sodium cyanide. If the potassium salt is used add 4 ozs./gal.

Cadmium solution:—

Cadmium	2.0 ozs./gal.
Free cyanide	.4 oz./gal.

Add 9 ozs./gal. of sodium cyanide.

G. B. H., Problem 5,448.

Nickel Throwing Power

Q.—We operate a bright nickel solution in a plating barrel. The brightener is the usual cadmium salt.

When the brightener is added, the throwing power is decreased considerably.

Can you tell us how to maintain a constant throwing power after the addition of a brightener?

A.—The use of sodium sulfate will improve the throwing power in a straight nickel solution. The concentrations employed can be in a range of 6 to 16 ounces per gallon.

G. B. H., Jr., Problem 5,449.

Small Nickel Plating Unit

Q.—Interested in doing nickel plating in a small way. Want to know how to arrange lighting circuit so it can be used for plating.

A.—Direct current is required for electroplating. The voltage required is usually not over six volts, and for nickel plating alone 2 volts would be sufficient in a small still tank.

The lighting current is 110 volts alternating current in most cities. In these cases it is necessary to reduce the voltage and rectify. This operation is performed by storage battery chargers, many of which are now in the market. They can be used as a source of current for plating but it must be remembered that they deliver a pulsating current, that is, an interrupted alternating current, due to the fact that they rectify only one half of the alternating current cycle.

For the most part the pulsating current does not affect the character of the electrodeposit but it does take twice as long to build up a certain thickness of plate with pulsating current as it does with continuous direct current.

In some localities the lighting current is 110 volts direct cufrent. In such cases the lighting circuit can be used if the voltage is cut down. This can be done by means of resistances or by means of a lamp bank.

The more lamps that are screwed in the higher will be the current obtained. Use old carbon filament bulbs. Plate with 10 amps./sq. ft. of work surface.

G. B. H., Jr., Problem 5,450.

Solutions Too High in Nickel

Q.—Three samples of nickel solution to be analyzed. Still tanks are operated at room temperature with no brightener.

Analysis:	Sol. I	Sol. II	Sol. III
Metallic nickel	4.41 oz.	3.42 oz.	5.13 oz. per gal.
Chloride as ammonium chloride	1.76 oz.	1.96 oz.	1.74 oz. per gal.
pH	—5.2	—5.2	—5.2

All three solutions are too high in metal and too low in chloride. The solutions are also too acid.

To bring the solutions back to the proper working formula the following is recommended:

Solution I. Discard ¼ of the bath and replace with water. Add 1.5 oz./gal. ammonium chloride and 1 pint of ammonia to each 100 gal. of the bath.

Solution II. Add 1 oz./gal. ammonium chloride and 1 pint of ammonia to each 100 gal. of the bath.

Solution III. Discard 2/5 of the bath and replace with water. Add 2 oz./gal. ammonium chloride and 1 pint of ammonia to each 100 gal. of the bath.

G. B. H., Jr., Problem 5,451.

Patents

A Review of Current United States Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,995,593. March 26, 1935. **Method of Refining Molten Zinciferous Lead.** Paul Wefelscheid, Braubach, Germany, assignor to American Lurgi Corporation, New York, N. Y.

1,995,616. March 26, 1935. **Connection for Joining Sections of Range, Boilers and Pressure Vessels and Method of Making.** Henry W. Kamack, Waterbury, Conn., assignor to The American Brass Company, Waterbury, Conn.

1,995,746. March 26, 1935. **Piston.** Adolph L. Nelson, Indianapolis, Ind., assignor to Bohn Aluminum & Brass Corporation, Detroit Mich.

1,995,766. March 26, 1935. **Material for and Process of Pickling and Cleaning.** Allan E. Chester, Cleveland, Ohio, assignor to Ferro Enamel Corporation, Cleveland, Ohio.

1,995,862. March 26, 1935. **Polishing Composition.** Herbert Spencer Polin, New York, N. Y., assignor to Polin, Inc., New York, N. Y.

1,995,954. March 26, 1935. **Rust-Resisting Coating Composition.** Herbert O. Albrecht, Flint, Mich., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del.

1,996,031. March 26, 1935. **Apparatus for Treating Material.** Kurt Theodore Potthoff, Brooklyn, N. Y., assignor to U. S. Galvanizing & Plating Equipment Corporation, a corporation of West Virginia.

1,996,187. April 2, 1935. **Method of Marking Plated Articles.** George E. Barnhart, Pasadena, Calif.

1,996,342. April 2, 1935. **Electrolytic Refining and to the Casting of Anodes and the Like.** Alexander Grant McGregor, London, England.

1,996,360. April 2, 1935. **Soldering Flux.** Conral C. Callis, Oakmont, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

1,996,361. April 2, 1935. **Soldering Flux.** Conral C. Callis and Ralph B. Derr, Oakmont, Pa., assignors to Aluminum Company of America, Pittsburgh, Pa.

1,996,362. April 2, 1935. **Soldering Flux.** Conral C. Callis and Ralph B. Derr, Oakmont, Pa., assignors to Aluminum Company of America, Pittsburgh, Pa.

1,996,379. April 2, 1935. **Heat Treatment of Easily Oxidizable Metals.** Fred Keller, Jr., New Kensington, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

1,996,392. April 2, 1935. **Lubricating Metal Foil.** Thomas A. Torrence, Parnassus, and Frank L. Endean, Pine Manor, Pa., assignors to Aluminum Company of America, Pittsburgh, Pa.

1,996,396. April 2, 1935. **Machine for Dressing Revolving Grinding Wheels.** Harry Frederick Atkins, Old Fletton, Peterborough, England.

1,996,570. April 2, 1935. **Lacquer.** Oscar A. Cherry, Chicago, Ill., assignor to Economy Fuse and Manufacturing Company, Chicago, Ill.

1,996,657. April 2, 1935. **Method of Joining Metallic Surfaces.** Randolph W. Shannon, New York, N. Y.

1,996,715. April 2, 1935. **Cellulose Lacquer Composition.** Charles Bogin, Terre Haute, Ind., assignor to Commercial Solvents Corporation, Terre Haute, Ind.

1,996,721. April 2, 1935. **Thermostatic Material and Method of Manufacturing Thereof.** Ralph F. Gibbs, Norton, Mass., assignor to The Improved Seamless Wire Company, Providence, R. I.

1,996,730. April 2, 1935. **Corrosion Inhibitor.** Charles A. Thomas, Wayne, and Charles G. Grosscup, Philadelphia, Pa., assignors to The Sharples Solvents Corporation, Philadelphia, Pa.

1,996,840. April 9, 1935. **Process of Enameling Metal Articles.** Homer F. Staley, Warren Township, Somerset County, N. J.

1,996,985. April 9, 1935. **Process for Parting Residues, Sweepings, and the Like Containing Precious Metals.** Wilhelm Truthe, Frankfort-on-the-Main, Germany.

1,997,141. April 9, 1935. **Improved Process for Bronzing Articles and Parts Made of Iron and Alloys of Iron and Carbon.** Berardo Guerini, Brescia, Italy.

1,997,165. April 9, 1935. **Duplex Metal Article.** Robert H. Brown, New Kensington, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

1,997,166. April 9, 1935. **Duplex Metal Article.** Robert H. Brown, New Kensington, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

1,997,200. April 9, 1935. **Alloy Covered Cable Manufacture.** Earle E. Schumacher, Maplewood, N. J., and George M. Bouton, Lynbrook, N. Y., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y.

1,997,334. April 9, 1935. **Apparatus for the Electroplating of Metal Objects.** John Kronsbein, Smethwick, England, assignor of one-half to Charles Frederick Neale, Birmingham, England.

1,997,337. April 9, 1935. **Cellulose Higher Acyl Radical Lacquers.** Carl J. Malm, Rochester, N. Y., and Charles E. Waring, Dayton, Ohio, assignors to Eastman Kodak Company, Rochester, N. Y.

1,997,340. April 9, 1935. **Lithium Silicon Composition.** Hans Osborg, Teaneck, N. J., assignor to Maywood Chemical Works, Maywood, N. J.

1,997,458. April 9, 1935. **Electroplating Machine.** Edward T. Ehrhardt, Whitman, Mass., assignor of one-half to G. G. Roberts Corporation, Whitman, Mass.

1,997,494. April 9, 1935. **Aluminum-Base Alloy.** William E. Mansfield, Garfield Heights, Ohio.

1,997,500. April 9, 1935. **Method of Manufacturing New Articles of Jewelry and Ornaments.** Daniel Swarovski, Wattens, Tyrol, Austria.

1,997,602. April 16, 1935. **Process of Refining Molten Metal.** Richard Robinson, Dormont, Pa., assignor, by mesne assignments, to Frank S. Christy and Nanette Christy, Crafton, Pa.

1,997,626. April 16, 1935. **Wire Wrapping Machine.** Constantine A. Caldes, Jersey City, N. J., assignor to Anaconda Wire & Cable Company, New York, N. Y.

1,997,741. April 16, 1935. **Muffle Inductor Electric Furnace.** Edwin Fitch Northrup, Princeton, N. J., assignor to Ajax Electrothermic Corporation, Ajax Park, N. J.

1,997,988. April 16, 1935. **Furnace Lining Protection.** Franz Wever, Dusseldorf, Germany, assignor to Ajax Electrothermic Corporation, Ajax Park, N. J.

1,997,989. April 16, 1935. **Metal Polish.** Heinrich W. Witzel, Ingram, Pa., assignor, by mesne assignments, to American Cyanamid & Chemical Corporation, a corporation of Dela.

1,998,045. April 16, 1935. **Process of Making Vitreous Enamel Coated Sheets.** Joseph C. Eckel, Ingram, Pa.

1,998,168. April 16, 1935. **Alloy.** Roy E. Paine, Cleveland, Ohio, assignor, by mesne assignments, to Magnesium Development Corporation, a corporation of Delaware.

1,998,169. April 16, 1935. **Alloy.** Roy E. Paine, Cleveland, Ohio, assignor, by mesne assignments, to Magnesium Development Company, a corporation of Delaware.

1,998,170. April 16, 1935. **Alloy.** Roy E. Paine, Cleveland, Ohio, assignor, by mesne assignments, to Magnesium Development Corporation, a corporation of Delaware.

1,998,171. April 16, 1935. **Alloy.** Roy E. Paine, Cleveland, Ohio, assignor, by mesne assignments, to Magnesium Development Corporation, a corporation of Delaware.

1,998,316. April 16, 1935. **Mold Clamping Device.** Marius Guyot, Cleveland, Ohio, assignor to Aluminum Company of America, Pittsburgh, Pa.

1,998,466. April 23, 1935. **Bronzing Machine.** Joel F. Sheppard, Frank C. Stevens, and Carl G. Lindbom, Dover, N. H., assignors to U. P. M.-Kidder Press Co., Inc., Dover, N. H.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Dowmetal "H"—a Magnesium Sand Casting Alloy

Dowmetal "H" is a new alloy made by The Dow Chemical Company, Midland, Mich. It is recommended because of its high mechanical properties and improved corrosion resistance. A combination of properties hitherto not obtained on magnesium alloys is accomplished by the application of special heat treatments designated No. 1a and No. 3a.

Chemical Composition

Aluminum—5.5—6.5%
Zinc—2.7—3.3%
Manganese—0.18% Min.
Magnesium—Remainder

Physical Properties

Specific Gravity (75°F)	1.83
Weight	0.066 lbs/cu. in.
Melting Point	1155°F
Coefficient of Thermal Expansion (between 65—750°F)	0.000016 per°F

Sand Castings

Dowmetal "H" may be used for sand castings with the same general technique that is applied to other Dowmetal casting alloys. The same patterns may be used as the shrinkage factor is unchanged. The heat treatment of Dowmetal "H" involves a slight change in the procedure as applied to other Dowmetal alloys. No 1a is a solution heat treatment, and No. 3a is a solution heat treatment followed by complete aging or precipitation.

Mechanical Properties

The mechanical properties obtained on sand cast test bars in the as cast and heat treated conditions are given in the following table.

Corrosion Resistance and Surface Finishing

Dowmetal "H" has approximately three times the corrosion resistance of Dowmetals "F," "A," and "G" when subjected to alternate immersion in 3% salt solution. Castings made from Dowmetal "H" respond to the Chrome-Pickle treatment and may be painted subsequently the same as other Dowmetal alloys.

Condition	Tensile Strength lb/sq. in.	Yield Strength lb/sq. in.	Elongation %	Hardness Rockwell (E)	Hardness Brinnell	Impact Toughness (Izod) ft. lb.
As Cast	25-30,000	11-13,000	4-8	54-61	47-51	2-5
H. T. No. 1a	33-38,000	11-14,000	9-13	59-64	50-53	4-6
H. T. No. 3a	37-42,000	18-21,000	3-7	76-82	65-72	1-3

Flexlock Joints

During Chemical Exposition Week, December 2-7, 1935, The **United States Stoneware Co.**, 50 Church Street, New York, will show in their hotel suite at the Hotel Lexington, Lexington Ave. and 48th St., New York City, their new moving picture film entitled "Flexlock, —the Wonder Pipe Joint." Flexlock Joints were developed by The B. F. Goodrich Co.,—and their adaptability for use with chemical stoneware bell-and-spigot piping was worked out in cooperation with The U. S. Stoneware Co.

The film will demonstrate exactly how Flexlock lines are installed, under different service conditions. The following advantages are claimed:

1. Positive seal—no joint leaks.
2. Flexibility—takes care of expansion and soil stress.
3. Installation ease—that no other joint can be made so quickly.
4. Permanence—no joint replacements.
5. Low installed cost—cheaper per laid foot than poured-type joints.
6. Unaffected by any fluid—even handles solvent hydro-carbons.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Full Hydraulic Die Casting Machines; with electric timing mechanism allowing the operator to set the machine for any pre-determined period. Reed-Prentice Corporation, Worcester, Mass.

Vitrified Porous Stone Acid Filters; for continuous filtration of acids to remove residues and foreign materials. R. P. Adams Company, 220 Delaware Avenue, Buffalo, N. Y.

Electro-Mechanical Welding Timers; for use in the welding of alloys and plated metals. Welding Timer Corporation, Chrysler Building, New York.

Spiral Shaped Nails; for use with asphalt roll roofing. W. H. Maze Company, Peru, Ill.

X-Ray Installation

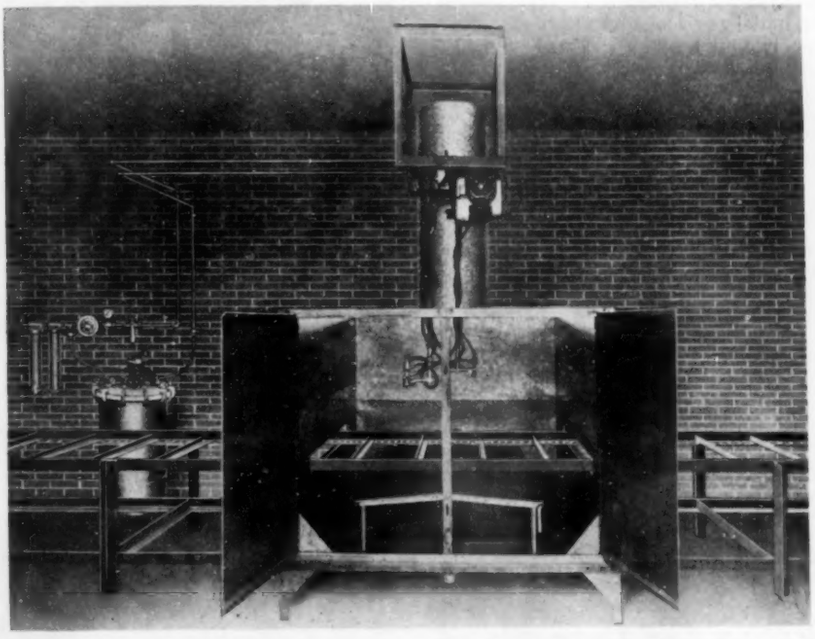
The St. John X-Ray Service, Inc., 30-20 Thomson Avenue, Long Island City, N. Y., has installed an Educational X-Ray Unit at the new Brooklyn Technical High School, Brooklyn, N. Y. It consists of a heavy lead-lined cabinet which encloses a standard 200,000 volt x-ray generator and air cooled tube. By means of diffraction patterns, the crystal structure of the various metals can be checked before and after heat treatment. In foundry practice, the sand molds can be viewed under the fluoroscope and the chaplets placed properly before the casting is made. After the casting is made, it can be x-rayed with the gate metal left in place.

The installation is large enough to take care of the inspection of entire airplane fuselage structures.

Swinging Arm Spray Coating Machine

The DeVilbiss Company, Toledo, Ohio, has developed a swinging arm spray coating machine which has been designed for production spray coating of flat products, up to four feet in width, such as sheet metal and the like. The machine, it is claimed, applies a smooth, even finish at a speed of from ten to forty lineal feet per minute, depending upon the type of surface, kind of finish desired, kind of finishing material used and speed of conveyor.

Supported in a suitable frame, the machine is mounted to the ceiling above the conveyor which carries the work to be sprayed. The mechanism used to drive the two arms is so designed that a slowly increasing and decreasing reciprocating motion is obtained which compensates for the arc which would be produced by swinging the arms from a fixed position. The result is a uniform sprayed coating.



DeVilbiss Swinging Arm Spray Coating Machine

The machine, therefore, closely follows the technic of the manual spraying operation. The spray guns are automatically opened and closed at the beginning and end of each stroke just the same as is done in proper hand operation. The spraying time of the guns during the stroke can be varied to suit the width of the product to be sprayed.

Down-Draft Spray Booth

This spray booth was designed especially for use with a conveyor in connection with the Swinging Arm Machine. Made of galvanized iron, it is composed of four sides and a bottom. The conveyor and the work it carries is admitted to the booth through openings on opposite sides. Front of booth consists of two large doors permitting easy access for periodic cleaning.

Bottom of booth is flat, usually about twelve inches from floor of room. The exhaust duct, at bottom of booth, is at right angles to the conveyor. It is composed of a removable top and adjustable side openings so set to create an even distribution of exhaust. Fan connection is made at the back of the booth from which the exhaust pipe may be run in a vertical or horizontal direction. The booth is equipped with a Type JH exhaust fan of either one or two horsepower depending upon the size of the booth.

The booth has no top and the air is drawn through the booth in a downward direction, the same direction in which the guns spray. There is nothing crossing over the conveyor, except the single thickness of sheet metal which form the sides of the booth, so there is no surface upon which deposits may accumulate and later drop off onto the finished work. The booth size depends upon the width of the work to be sprayed. Normally it should be about four feet wider than the work, but five feet high and eight feet long. Each booth is specially built to meet the individual requirements of its installation.

Spraying Equipment

Standard items of spraying equipment are used to complete such an installation as that illustrated. This equipment will consist of a pressure feed paint tank of suitable capacity and the necessary air and fluid piping, valves, etc.

The Swinging Arm Machine and Down-Draft Spray Booth are designed, engineered and built on special order only. Each installation has its own particular requirements and no two can be served with exactly the same equipment. The equipment will be recommended only in such cases as are found, from a careful survey, where its use will increase production and result in lower finishing or coating costs.

Electrodeposition of Tungsten With Related Elements

A process by which tungsten is electrodeposited in combination with one or more related elements simultaneously through the same electrolytic solution, e. g.: tungsten-nickel, tungsten-cobalt, tungsten-iron, tungsten-tantalum, and others, called the Tungsten Alloy Process was discovered and developed by Harry Howard Armstrong and Arthur Burley Menefee, Metallurgical and Mining Engineers of California.

The flexibility of the tungsten electrodeposit process is shown, it is stated, by the results accomplished with tungsten in combination with some of the most important metals. The process, it is claimed, produces a high acid, heat and alkali resistant, non-corrosive, non-erosive alloy deposit on cast-iron, steel, copper, zinc, brass, bronze, etc.

In the binary group alloys are produced of tungsten-nickel, tungsten-cobalt, tungsten-tantalum, tungsten-iron. In the ternary group, tungsten-nickel-cobalt, tungsten-nickel-tantalum, tungsten-nickel-iron. In the polynary group, alloys of four and more metals have been produced. In the electrodeposit of tungsten-nickel the best results obtain in percentages ranging from 30% to 50% tungsten and 50% to 70% nickel. These percentages may be controlled.

The following characteristics of the deposit are given:

Extremely dense, also very cohesive to the metal upon which deposited.

Highly resistant to many strong and weak acid and alkali solutions—hot and cold.

Brilliant platinum-silver, nickel-silver colors susceptible to very high polish.

Extremely high melting point of the combined tungsten-nickel alloy.

Gradually hardens under heat and carbon atmosphere, becoming highly non-erosive.

The tungsten-nickel electrodeposits are very ductile—the copper, steel and brass test plates may be bent or twisted without affecting the deposit.

The tungsten electrodeposits are highly resistant to concentrated or diluted sulphuric, nitric and hydrochloric acid solutions for very long periods of time.

On internal combustion engine valves these tungsten alloy electrodeposits, under severe conditions, will show remarkable resistance and the deposits will be found intact and adherent after test, with practically no pitting.

The process is controlled by the Tungsten Electrodeposit Corporation, Barr Building, Washington, D. C.

New Automatic Control on Detroit Rocking Furnaces

A step forward toward a completely automatic furnace for controlled electric melting is announced by Detroit Electric Furnace Company, 825 W. Elizabeth Street, Detroit, Mich. Equipment will be embodied as standard on all new models effective for 1936. This improvement provides a means for automatically controlling the rocking cycle of the furnace to compensate for differences and variations in the charge.

In analyzing the melting variables which have to be dealt with in a foundry it is evident that these fall into several classes.

1. Differences in physical characteristics of the charge.
2. Differences in specific heat of the charge.
3. Differences in chemical composition.
4. Variations in tapping temperature.
5. Differences in total weight of the charge.

The new automatic rocking control Type AR-1, is said to enable the furnace operator to **predetermine and repeat** the rocking cycle which is most advantageous metallurgically and thermally. The correct cycle may be repeated exactly.

The roof and hearth of the furnace may be alternated on successive heats thus equalizing the wear on the lining with a consequent lowering of lining cost. The device enables the operator to bring the furnace to full rock, automatically, in the shortest possible time so that the charge may be rapidly melted, utilizing the heat stored in the lining, as well as that directly from the arc. The new mechanism will, therefore, it is claimed, improve thermal economy and aid in reducing melting cost.

The rocking cycle may be recorded on the log, together with data as to composition, power input and weight. The metallurgist can add to this the resulting physical composition obtained and the results are thereafter available for easy duplication.

It is stated that one operator can now easily serve a battery of furnaces or, if handling one unit, is free to perform other necessary duties while not actually charging or pouring the furnace.

A remote push button hand control is provided to pour and reverse the furnace, giving the operator greater precision control than was heretofore available. A built-in safety limit switch prevents accidental spilling of the metal because of the furnace going past the normal safe rock in either direction (unless the operator uses the portable push-button control.) On the new control a set of dials is provided which determines: first, the location of the door at the time the rocking is to start; second, the initial angle of rock; third, the duration in minutes of the initial angle before the rocking angle is gradually increased; fourth, an adjustment for rapid increase or slow increase so that for bronze, for example, the furnace may come to full rock twenty minutes after it is started. This is especially useful since the rate of rocking increase can be accelerated, automatically as the charge becomes more and more molten. The switch is set at the beginning of each heat and requires no further attention until the melting operation is complete. If for example, it is interrupted midway in the cycle by the operator, it will, when permitted, continue on and finish the cycle without further adjustment.

This development has been made chiefly to equip new Detroit Electric Furnaces where it becomes standard apparatus. It has, however, been designed so that it can be applied to practically all Detroit Furnaces of the 200 pound size and upward. The switch is a development of L. V. Pittman, Chief Draftsman, and C. M. Weinheimer, Chief Engineer, of the Detroit Electric Furnace Company.

New 12" Grinder

Baldor Electric Company, 4351-63 Duncan Avenue, St. Louis, Mo., announces the addition of a 12" bench and pedestal grinder to their present grinder line. The features of this new product according to the manufacturer, are: heavy duty motor, either 2 H.P. or 3 H.P. according to preference; exhaust

Baldor 12" Grinder

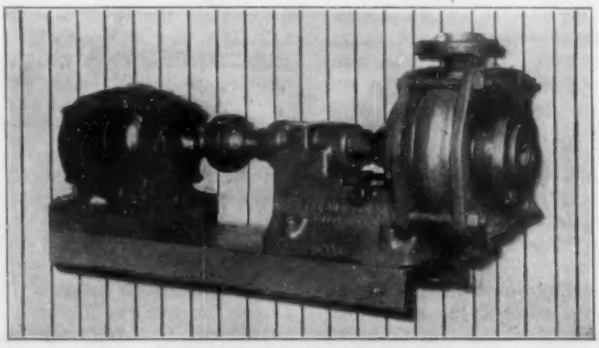
type, hinged guards; adjustable tool rest, which can be tilted for angle grinding; heavy wide-base pedestal.

Standard equipment includes waterpot, tool trays and starter. The manufacturer offers a free descriptive bulletin to those writing for it.

Pump for Corrosives

A new centrifugal pump for handling corrosive solutions has been put on the market which should interest electroplaters and others using corrosive chemicals. It is rated from 35 gallons per minute to a 12 ft. head, to 10 gallons per minute to a 37 ft. head. With this range of capacity and head, it makes a very useful pump for handling plating solutions and for filter work. The pump has a 1½" suction and 1" discharge with both openings arranged for connecting to flanged, lead or screwed pipe. A half to three-quarter horsepower motor is used, depending upon the quantity to be handled. The impeller is the non-clogging, closed type and is 6" in diameter. The pump is light enough in weight so that it can be moved easily or even mounted on a truck for use as a portable unit.

The pump, known as the Duriron No. 2B, is being made in corrosion-resisting metal alloys by The Duriron Company, Inc., Dayton, Ohio, for the handling of any corrosive solution. The Duriron Company will be glad to send complete information to anyone interested upon request.



Duriron Pump for Corrosives

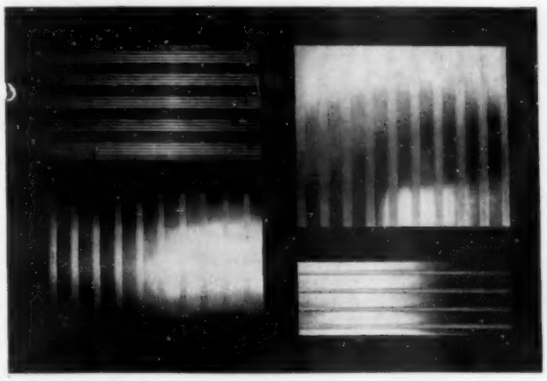
Stripes and Patterns in Strip Steel

Strip steel in a new and attractive finish is now being marketed by Acme Steel Company, Chicago.

"Satinstripe" is the name of this type of finish, which is composed of stripes or patterns rolled into the steel by specially ground rolls. Satinstripe is available in many different kinds of stripes, varying in width and depth.

Even with the application of chrome, nickel or color finishes, the beauty of the design shows through clearly.

It is expected that Satinstripe will have wide application in providing both practical and smartly attractive finishes for a large number of different products. The "modern" appearance of this finish will undoubtedly see it used for products where the design is modern.



Acme Satinstripe Steel

Chemicals for Jewelry Manufacture

Mark Weisberg Laboratories located in Providence, Rhode Island, the jewelry center of the United States, have specialized for the past six years in developing special chemicals to aid the jewelry and novelty trade in the production of better and more economical finishes to meet the trends of the times.

Rhodium for silver and gold plating, as well as for white metal rhinestone jewelry, has been supplied to the trade for the past five years in a solution form, ready for plating. These solutions work cold and require only a half minute plate to obtain brilliant colors of silvery appearance. The Rhodium is marketed under patent protection. In spite of the high cost of Rhodium, a good plate can be obtained for as little as thirty cents per square foot.

For a cheaper grade of jewelry and novelties, an imitation white salt is marketed under the name of Rhode White which gives a brilliant, white finish in half a minute plating time at a cost of less than one cent per square foot. This finish is non-tarnishing and can be plated over any metal.

Another specialty is a salt known as Gold Smut Base, used for obtaining antique gold finishes. No gold is used with this Smut but any shade of antique from a light rose to a dark red can be obtained, it is stated, by the use of this Gold Smut Base.

The Mark Weisberg Laboratories have been marketing for the past five years a White Gold Base Salt. Two ounces of this salt and one dwt. of gold will, it is claimed, plate an acid proof 12K white gold alloy with no variations. This bath can be used consistently for months and even years without change. Only salts and gold are added from time to time to keep the work uniform.

Other specialties marketed by Mark Weisberg Laboratories to aid the jeweler in his problems include soldering fluxes, immersion plating solutions and salts to obtain special results in plating.

New Coating

A new type of coating is being produced by the Sparhawk Company of Sparkill, N. Y., which it is claimed, has extraordinary qualities. The manufacturers state that it is unaffected by cold, heat, water, steam or moisture, and that dampness does not cause it to mold or decay. It is said to be non-inflammable, non-poisonous, and to withstand temperatures of 1500 deg. F. without cracking or peeling.

This coating is sold in two forms called Sam-Bal and Sur-Mac, both viscose liquids which pour easily and can be applied quickly with rollers, knife spreaders, brushes and with the addition of petroleum solvents, by the air gun. Sam-Bal, it is stated, holds in suspension insoluble particles, such as metallic powders, (aluminum, bronze, copper, etc.) By the use of this material it is claimed that metal can be applied to such bases as tissue paper, cloth, etc.

These materials are also said to give a high lustre and brilliant gloss, which makes them useful for tin and aluminum collapsible tubes.

New Goggle Ful-Vue Style

A new patented goggle, exactly like the well-known Ful-Vue spectacles in its appearance and in many of its design features, has just been announced by American Optical Company, Southbridge, Mass.

Chief advantages of the new F3100, Ful-Vue goggle, as stated by the manufacturer, are its handsome appearance and its comfort, features which are expected to make it easier to enforce goggle programs. For the customary nose-piece, the new goggle substitutes pearl full-rocking nose-pads which distribute the slight weight of the goggle on the sides rather than on the top of the nose. Ear-pieces are of flexible cable, completely insulated, so that no metal touches the skin at any point. As on the Ful-Vue spectacle frames, the car-pieces are set high on the rims.

American Optical 6-Curve Lens

A new goggle lens, having far greater impact resistance than any lens previously used in standard eye-protection equipment, is now being offered by American Optical Company. The new lens, called the 6-Curve Super Armorplate, gets its extra strength from its high curvature, according to a statement issued by the manufacturer. An indication of its superior impact resistance is provided in the account of tests used to determine its strength.

A one-inch solid steel ball was dropped on the lens from a height of ten feet. The standard test for goggle lenses specifies a 5/8-inch steel ball dropped from a height of 39 inches.

Besides its advantage in resisting impact hazards, the 6-Curve Lens is declared to be more effective in deflecting glancing blows, because of its higher curvature; and it is also stated that the curvature permits a closer fitting to the face without interfering with the eyelashes. In the event of fracture by an irresistible blow, tests indicate that the curvature tends to push the fragments out and away from the eye.

Impact Tests on Lens

Catalogs

Portable Electric Tools; for production, maintenance and construction. General Catalog No. 36. Skilsaw, Inc., 3310-20 Elston Avenue, Chicago, Ill. (489)

Solvent Degreasing is Simple, Rapid and Economical. An illustrated description of degreasing methods and machines. Rex Products and Manufacturing Company, 13007 Hillview Avenue, Detroit, Mich. (490)

Improved Pressure-Proof Chaplet. A complete mechanical analysis. The Angeli Nail and Chaplet Company, 4580 E. 71st Street, Cleveland, Ohio. (491)

Matchless Liquid Rouge. A new metal polish. Matchless Metal Polish Company, 726 Bloomfield Avenue, Glen Ridge, N. J. (492)

Dynamos for Electrotyping, Electroplating and General Electrolytic Work. Bulletin No. 14. Chas. J. Bogue Electric Company, Hoboken, N. J. (493)

Butterfly Type Blast Gates. W. S. Rockwell Company, 50 Church Street, New York. (494)

Metal Finishing; electroplating, chemicals, equipment, pickling, galvanizing, tinning and soldering. Grasselli Chemical Company, Inc., 629 Euclid Avenue, Cleveland, Ohio. (495)

Carbon Brushes. A loose-leaf, pocket size, catalog containing data on the types in most general use. Ohio Carbon Company, 12508 Berea Road, Lakewood, Ohio. (496)

Wheelabrator Data Book. No. 111. An illustrated comprehensive description of airless abrasive cleaning and preparation. American Foundry Equipment Company, 555 Byrkit Street, Mishawaka, Ind. (497)

Commercial Chromium Plating. Circular No. 414, describing the facilities for hard chromium plating jobbing work. Pratt and Whitney Company, Hartford, Conn. (498)

Chlorinated Hydrocarbons. A technical booklet listing their characteristics, properties, specifications and other useful information. E. I. duPont de Nemours and Company, Inc., Wilmington, Dela. (499)

Modern Melting. A combination hand and catalog, loose-leaf, containing general melting information and data on rocking arc furnaces, auxiliary furnace and foundry equipment, etc. Detroit Electric Furnace Company, 825 W. Elizabeth Street, Detroit, Mich. (500)

Non-Ferrous Castings. Hecla bronze (bearing metal); Everdur; aluminum alloys, Government bronze; nickel alloys; hydraulic bronze; manganese bronze; composition metal, etc. Thomas Paulson & Son, Inc., 450 Union Street, Brooklyn, N. Y. (501)

Second Edition of General Catalog of rubber products such as belting, hose, packing, molded goods, friction material, rubber coverings, abrasive wheels, etc.; also bulletins on Condor Compensated Low Tension Rubber Belt; Condor Whipcord V-Belts and Condor Whipcord Endless Transmission Belts. Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J. (502)

Screws, Bolts, Nuts. American Standard dimensional data, weight tables and other information. Pheoll Manufacturing Company, 5700 Roosevelt Road, Chicago, Ill. (503)

25 Years of Achievement in the Manufacture of Porcelain Enameling Materials. A large, profusely illustrated folder of the Porcelain Enamel and Manufacturing Company, Eastern and Pemco Avenues, Baltimore, Md. (504)

Bonis. Die coating and mold dressing for all non-ferrous die and permanent mold castings. St. John X-Ray Service, Inc., 30-20 Thomson Avenue, L. I. City, N. Y. (505)

The Chemicrometer. For measuring thickness of cadmium and zinc deposits by the dropping method. Plating Products Company, 352 Mulberry Street, Newark, N. J. (506)

The Technical Aspect of Polishing Grain. Research and Alundum polishing grain. Norton Company, Worcester, Mass. (507)

Aluminum in Shop Fitting and Display. An attractive booklet on the scope of aluminum, its practical application in shop fitting and display, practical points on its use and fabrication. British Aluminium Company, Ltd., Adelaide House, King William Street, London, E. C. 4, England. Arthur Seligman and Company, Inc., 30 Rockefeller Plaza, New York, agents. (508)

Save time. Use the coupon below to get any of the above catalogs or bulletins, or for data on any subject not mentioned this month. METAL INDUSTRY will see that you get them promptly.

METAL INDUSTRY
116 John Street, New York.

(Insert below the number in parentheses at end of each item desired.)

I wish to receive the following catalogs mentioned in December, 1935

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Name ..... Address .....

Associations and Societies

American Foundrymen's Association

222 W. Adams Street, Chicago, Ill.

The American Foundrymen's Association announces the formation of four new chapters during the past six weeks. On October 10, The St. Louis District Foundrymen's Club became the St. Louis District Chapter; on October 17, the Detroit Foundrymen's Association became the Detroit Chapter; on November 8, the Milwaukee Chapter was formed; and on November 15, a group of foundrymen in and around San Francisco formed the Northern California Chapter.

The rapid formation of Chapters of A.F.A. indicates the increasing interest throughout the foundry industry in technical advancement and the desire for foundrymen to discuss mutual problems. It is quite probable that further Chapters will be formed in other locations in the near future.

There are now eight Chapters of A.F.A., including those recently formed. The first Chapter was formed in Chicago in 1934 and this year others were formed in the Quad Cities, Philadelphia, and Cleveland, the latter being known as the Northeastern Ohio Chapter.

American Society for Testing Materials

260 South Broad Street
Philadelphia, Pa.

A.S.T.M. Work in Non-Ferrous Metals

Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys.—The question of the effect of temperature on the rate of corrosion in the salt spray test has been under consideration and further studies of this phase of the accelerated test will be made.

The 1935 report of the committee includes test data on 24 different metals in rural, sea coast and industrial atmosphere extending over a period of three years at eight test locations and in addition results of tests carried on in sea water, NaOH and H_2SO_4.

One of the most interesting committee projects deals with a study of galvanic and electrolytic corrosion carried on by exposing different couple combinations to the atmosphere of the various test location. This work has now made it apparent that the table of "Electrolytic Single Potential Differences" does not necessarily predict which metal of a couple will corrode nor the extent of that corrosion.

The tests in the atmosphere, in liquids and with the couple combinations will be continued.

Committee B-4 on Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys.—On account of the comparatively long time required to make the life test on electrical heater wire, due to the improvement in quality which has been made, tests are under way to determine whether the temperature of the test can be increased from 1950 F. to 2050 F. to expedite the test. The committee is working on the development of a standard method of test for temperature coefficients of resistance of sheet manganin. It has been necessary to establish the conditions under which test is to be made and the annealing of the specimens.

Several types of testing machines have been investigated for determining the stiffness of electrical resistance wires, by means of a bend test.

The subcommittee on Alloys for High-Temperature Use has under way the development of a tension test specimen for testing cast alloys at temperatures up to 2000 F. It has been found necessary to describe the casting technique in order to insure sound casting. The specimens will be examined with x-ray and will then be tested in several laboratories at elevated temperatures.

A high-temperature bend test is also under consideration, which is intended especially for structural materials in electric furnaces. A test to determine the tendency of alloys to warp at elevated temperatures also is under consideration.

Subcommittee on Thermostatic Metals has prepared definitions for the various terms used in connection with the testing of thermostatic metals. Tests are being made to determine the deflectivity, deflection stiffness and hardness of three thermostatic materials representing low, medium and high-temperature service respectively. The work is being carried on in cooperation with the Thermostatic Bi-metal Manufacturers' Assn.

Committee B-5 on Copper and Copper Alloys, Cast and Wrought.—This committee which has completed an active year is planning to prepare specifications for wrought phosphor bronzes and also standards covering wrought low brass and commercial bronze strip. Certain of the newer condenser tube alloys have been under study and specification requirements are being developed for these with the possibility that consolidation of all condenser tube requirements into one standard may prove to be feasible. The committee also is planning to revise some of the new silicon bronze specifications so that they may be brought more nearly in line with present commercial practice.

The committee has under way a program involving revisions of casting specifications under its jurisdiction to bring them into proper relationship with the ingot metal specifications and to modernize them.

Exposition of Chemical Industries

Grand Central Palace, New York, N. Y.

The keynote of the 15th Exposition of Chemical Industries, to be held December 2-7, at Grand Central Palace, New York, will be found in the exhibit of the American Chemical Society. The Society will present an extensive and interesting pageant of products entitled "Children of Recovery." Evidence that research pays, in spite of business conditions, will be proved by the concrete evidence offered by more than one hundred different new products of research marketed in 1934-35.

In addition to the displays of chemical products, exhibits of plant equipment and the machines used in the industry will be comprehensive and fascinating. Included in this field will be pressure and continuous vacuum filters, acid pumps, and a wide range of accessory equipment for each of the unit processes of chemical engineering. There will be dust proof mixers of various types and sizes.

Metals and alloys will be featured in a number of distinct exhibits. Another exhibit in the metals section is described as "New, different, economical, and interesting alloys; also chemical and ceramic materials of titanium and zirconium for use in many phases of the chemical, metallurgical and ceramic fields. Platinum and the other precious metals will be shown in terms of all of their new technical and commercial uses.

Lead will be well represented by exhibits of all types of sheet lead, lead pipe, fittings, wire, rod and bar stock, also lead wool and examples of lead burning and welding. An exhibition in this field will call attention to the service of installation anywhere in the United States under the direction of expert lead burning engineers. Lead burning is said to be a highly specialized profession with the total number of highly competent men extremely small.

Protective coatings and chemical paints will be represented in many exhibits. Emphasis will be given to low-cost treatment for tripling the life of paint on structural steel. Among the special process exhibits will be chromodizing for protecting steel, electrogranodizing, a new method for rust proofing by phosphate coating; also treatments for making paint adhere to zinc and cadmium-plated steel, and to galvanized iron.

All matters of exhibitors' space and details of arrangement are being handled by the International Exposition Company, which has managed all of the previous Chemical Expositions. Charles F. Roth is again personally in charge.

Foundrymen's Equipment Program Held

A meeting was given over to a discussion of foundry equipment, by the Northeastern Ohio Chapter of the American Foundrymen's Association at the Cleveland Club, Cleveland, Ohio, on Thursday evening, November 14.

Arthur J. Tuscany, Executive Secretary of the Foundry Equipment Manufacturers' Association, presided at that portion of the meeting when the equipment subject was discussd.

The speakers and their subjects were:

"Shakeout Vibrators"—W. E. Naylor, Chief Engineer, The Beardsley & Piper Company, Chicago.

"Recent Molding Machine Developments"—Leon F. Miller, Sales Engineer, The Osborn Manufacturing Company, Cleveland.

"Some New Developments in Dust Collection"—M. I. Dorfan, Manager, Dust Collecting Division, Blaw-Knox Company, Pittsburgh.

"Recent Developments on Simpson Sand Mixer"—L. B. Knight, Jr., Sales Manager, National Engineering Company, Chicago.

"The Wheelabrator"—Elmer A. Rich, Vice President in Charge of Sales, The American Foundry Equipment Co., Mishawaka, Ind.

"Sand Testing Equipment"—H. W. Dietert, President, Harry W. Dietert Company, Detroit.

"The New Pangborn Airless Rotoblast Cleansing Barrel" and **"The Pangborn Norbide Long Wear Blast Nozzle"**—P. J. Potter, Vice President, Pangborn Corporation, Hagerstown, Md.

"Metal Abrasive in Cleaning Castings"—O. C. Sabin, Secretary, Steelblast Abrasives Company, Cleveland.

"Sly Master Blast Mill"—F. A. Ebeling, Sales Manager, The W. W. Sly Manufacturing Company, Cleveland.

"Brackelsberg Furnace" — M. F. Becker, Sales Engineer, Whiting Corporation, Harvey, Ill.

"Abrasive Cutoff Machine"—Leicester S. Lewis, Vice President, The Tabor Manufacturing Company, Philadelphia.

"Cooling Molding Sand"—H. L. McKinnon, Secretary, The C. O. Bartlett & Snow Company, Cleveland.

Heating & Ventilating Exposition

Enthusiastic support, reflecting improved business confidence, is evident now three months in advance of the opening of the Fourth International Heating & Ventilating Exposition. The national professional societies, the local committees, and the Exposition administration are cooperating in a way that must insure the finest Heating and Ventilating Exposition yet held. The Fourth Exposition comes to Chicago during the week of January 27-31, 1936. The International Amphitheatre in which it will be presented is one of the most modern and ample settings in which this air conditioning exposition has yet appeared.

Furnaces and boilers of every type and for every fuel will be on display, and there will be a comprehensive showing of unit heaters and central heating systems. Hot water heaters, both separate and for use in conjunction with main heating plants will be demonstrated with emphasis on speed and economy of operation. Every form of air conditioning with accessories will be shown in a large section of the Exposition devoted to this new field. There will also be many exhibits devoted to refrigeration and to the display of insulation materials protective against heat and cold. The ventilating section will cover all phases of the equipment problem from intake to distribution, showing a comprehensive pageant of fans, blowers, registers, grilles, and air filtering materials.

The conduct of the Exposition and all details of exhibit arrangement and leasing, are in charge of the International Exposition Company of Grand Central Palace, New York, and Charles F. Roth is again personally in charge.

Philadelphia Branch, A. E. S.

Headquarters, c/o George Gehling, 5001 Tulip Street

The Educational Meeting held on November 23rd opened at 2:30 P. M. with about 125 present. In addition to the speakers listed in **Metal Industry** for November, page 410, the two papers printed in year book were also read. They were: **The Position of the Practical Plater in Modern Industry**, by **R. Atkins; Etching Process for Name Plates and Dials** by **Harry Shelly.**

Charles Proctor was unable to attend due to ill health but his paper was read by **Phil Sievering.**

An innovation at this meeting was the presentation of small tokens of recognition to the following men for having completed 50 years or more of active service as "Platers": **Philip Uhl,** Philadelphia, Pa.; **George Gehling,** Philadelphia, Pa.; **Otto Mott,** Philadelphia, Pa.; **James McEvoy,** Lancaster, Pa.

The Educational Meeting adjourned at 6:30 P. M. and at 7:00 P. M. the Banquet swung into action with 193 persons present. Prizes donated by Egyptian Lacquer Mfg. Co., Proctor & Schwartz Electric Co., Philadelphia Mfg. Company, Reynolds-Robson Supply Co., Fox Company, were awarded to the Ladies and Gentlemen holding the "lucky numbers."

The attendance at the Educational Meeting in the afternoon was equal to any meeting ever held by Philadelphia Branch and is indicative of the interest being manifest in electrodeposited coatings of metal.

The attendance at the Banquet approaches the record set in better times and indicates that Mr. and Mrs. Plater are again ascending the ladder of better times.

Personals

A. E. White

A. E. White, professor of metallurgical engineering and director of the Department of Engineering Research, University of Michigan, Ann Arbor, Mich., was recently elected vice-president of the American Society for Testing Materials.

Professor White has had an outstanding career. Following his graduation from Brown University in 1907, and a

A. E. WHITE

year of study at Harvard, 1908, he was in charge of research on blast-furnace by-products, ores, etc., for Jones and Laughlin Steel Company. In 1911 he became instructor at the University of Michigan and assistant professor in 1913-1917. He has held his present positions since 1919. From 1917 to 1919 he was head of the metallurgical inspection division, Ordnance Department of the U. S. Army.

Professor White is active in the work of several A.S.T.M. committees in the metals fields. He is Chairman of the Steel Committees Group on Materials for High Temperature Service. He was the first president of the American Society for Metals and is Past Chairman of the Research Committee, American Society of Mechanical Engineers. In 1925 Brown University awarded him the honorary degree of Doctor of Science.

The Department of Engineering Research of the University of Michigan, of which Professor White is Director, has been responsible for a large number of publications on electroplating, many of which have been devoted to chromium.

George B. Hogaboom will give a talk on December 27, 1935 to the New York Branch, A.E.S., on the subject "What is Under the Plate."

Jerome Strauss has been elected vice-president in charge of research and development, of the Vanadium Corporation of America with offices at Bridgeville, Pa.

Charles H. Proctor will spend the winter in Florida for his health. His address until the end of March, 1936, will be Alameda Arms Apts., 709 N. Fort Harrison Avenue, Clearwater, Fla.

Robert C. Stanley, president of the International Nickel Company, 67 Wall Street, New York, has been elected a director of the General Electric Company.

John A. Coe, president of the American Brass Company, Waterbury, Conn., is convalescing from an operation.

C. M. Hoke, consulting chemist, Jewelers Technical Advice Company, 22 Albany Street, New York, read a paper on Metallurgy and Gemology in a Symposium on Women's Place in Industry, held during the 15th Exposition of Chemical Industries, Grand Central Palace, on Saturday, December 7th, 1935.

E. H. Dix, Chief Metallurgist, Aluminum Research Laboratories, New Kensington, Pa., is one of the group of scientists co-operating with the Carnegie Institute of Technology which is holding a series of lectures in the field of metals for the students of the Department of Metallurgy. Mr. Dix will speak on Structural Aluminum Alloys,

R. R. LaPelle, Industrial Heating Section Engineer, Power Engineering Department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., will speak on Industrial Heating Furnace Problems.

Howard Scott, research engineer, Westinghouse Research Laboratories, East Pittsburgh, Pa., will speak on Metals and Alloys in the Electrical Industries.

R. L. Templin, chief engineer of tests, Aluminum Research Laboratories, New Kensington, Pa., will speak on Forming, Testing and Design Problems.

Thomas W. Pangborn, President of Pangborn Corporation, Hagerstown, Md., was elected president for the third consecutive term of the National Founders' Association at their meeting in New York, November 22nd.

Obituaries

C. W. Harman

Charles W. Harman, a founder and former president of the Sterling Silver Manufacturers Association died at his home, 55 Locust Avenue, New Rochelle, N. Y., October 6th.

Mr. Harman retired from active business with Joseph Fahys Company, manufacturers of watch cases, after forty-one years of service, being general manager and secretary at that time. He then organized the Sterling Silver Manufacturers Association of which he was president for seven years.

William S. Christy

William S. Christy, insurance and real estate broker and prominent in civic activities died suddenly while working in his office at 45 Merrick Avenue, Merrick, L. I., November 18th. He was 68 years old.

Mr. Christy had retired in 1933 after being with the American Brass Company for fifty years, and had lived in Merrick since 1918. He was clerk of the Board of Education for the Central High School, District 3, vice-president and founder of the Merrick National Bank, a former president of the Merrick Republican Club and a Mason. Surviving are his widow, and a son William Christy, Jr.

George J. Bardo

George J. Bardo of New York, vice-president of the Bourbon Copper and Brass Company, Newport, Ky. and father of Paul Bardo, recently elected City Commissioner of Newport, Ky., died at his home in Newport, Ky., November 13th of a heart attack. He was 63 years old. He became vice-president of the company after the death of his father, Peter Bardo, founder and president of the company. His brother, Thomas Bardo, became president of the firm at that time. Besides his son and brother, he leaves two daughters.

Eugene Bournonville

Eugene Bournonville, an oxy-acetylene pioneer whose name was linked to that of Augustine Davis in the organization of the Davis-Bournonville Company in 1907, died at his home in Jersey City, N. J., October 14.

Mr. Bournonville was born in Belgium in 1863 and came to the United States in 1884. He became interested in acetylene lighting, following the discovery of a commercial method of making calcium carbide by Willson in 1892, and introduced the process developed by Claude and Hess to the United States for dissolving and compressing acetylene into cylinders under pressure. He also brought over one of the first Fouche oxy-acetylene welding torches from France in 1904. He was also active in the development of oxy-acetylene cutting.

Ernest S. Hirschberg

Ernest S. Hirschberg, chief engineer of the Dings Magnetic Separator Company, Milwaukee, Wisc., since 1913, died suddenly on October 10th of a heart attack on a train returning from a vacation trip to the north Wisconsin lake and woods country. He was born in Milwaukee in 1883 and was graduated from the college of engineering, University of Wisconsin in 1907.

Henry S. Hampson

Henry S. Hampson, for 15 years associated with the sales organization of Electro Metallurgical Sales Corporation, 30 E. 42nd Street, New York, died suddenly November 13 at his home in New Rochelle, New York. He was 42 years old.

A native of Waterbury, Conn., Mr. Hampson attended Lafayette University before entering business. Following a general business experience, he became associated with Electro Metallurgical Sales Corporation in August, 1920, as a sales representative in the New York office. Subsequently he transferred to the Pittsburgh office of the company, later returning to New York where he had been serving as sales representative.

William Carlton Read

William Carlton Read, for twenty-five years associated in an official capacity with metallurgical research and development activities of units of Union Carbide and Carbon Corporation, 30 E. 42nd Street, New York, died suddenly November 6 at his home in New Rochelle, N. Y. He was 47 years old.

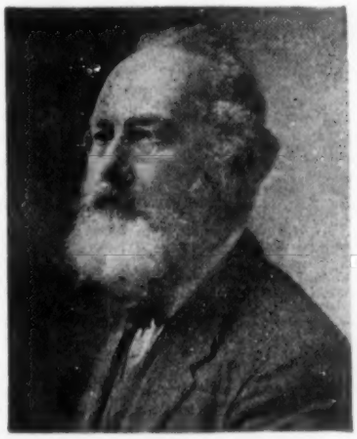
A native of Taunton, Mass., Mr. Read graduated from Massachusetts Institute of Technology in 1909 with the degree of Bachelor of Science.

In 1910, he became associated with Union Carbide Company at Niagara Falls, N. Y. Several years later he was transferred to the Saulte Ste. Marie, Mich., plant. In 1917, he returned to the Niagara Falls plants of the company and of Electro Metallurgical Company, where he remained until 1928 when he was transferred to the works managers' department in the general offices of these companies in New York. Since 1930 he had been associated with Dr. F. M. Becket in research and development work.

George C. Stone

George Cameron Stone, internationally known metallurgist, inventor and collector of ancient arms and armor, died recently at the New York Hospital in his seventy-seventh year. He lived at 49 W. 11th Street, New York, where funeral services were held.

Mr. Stone was associated with the New Jersey Zinc Company from 1882 to 1929 when he retired. He was known as "the human encyclopedia" for that company.



GEORGE C. STONE

In February of this year he received the James Douglas Gold Medal at the annual meeting of the American Institute of Mining and Metallurgical Engineers for distinguished achievement in non-ferrous metallurgy. He had belonged to the Institute since 1880.

Mr. Stone was said to have had one of the finest private collections of ancient arms and armor in the world and to have contributed liberally to the Metropolitan Museum of Art.

He was the son of the late George Eliot Stone and Anna Frances and a native of New York State. He was graduated from the School of Mines at Columbia University in 1879. He also belonged to the Century Association and to the Chemists Club.

His only immediate survivors are a brother, Frederick S. Stone, a nephew B. S. Stone and a niece, Helen S. Stone.

Industrial and Financial News

Metal Developments

The **Association of Consulting Chemists and Chemical Engineers, Inc.**, 50 East 41st Street, New York, has recently adopted a resolution suggesting a revision of the term "scientific opinion" as defined in Senate Bill S 5, introduced by Senator Copeland, providing for food and drug regulation. The Bill provides that scientific opinion may be called upon to support representations made with respect to drugs and devices. "Scientific opinion" is defined as "the opinion, within their respective fields of competent pharmacologists, physiologist or toxicologists." The Association recommends changing this definition to read, "Scientific opinion is the opinion, within their respective fields of competent specialists in the basic or applied sciences." We heartily endorse this revision.

The ocean liner **Queen Mary,** which was launched on September 26, 1934, and will make her trial trip in May, 1936, will use a huge amount of electroplated ware, 16,000 pieces, including meat dishes, dish covers, vegetable dishes, tea sets, sugar basins, butter dishes, trays, etc. She will also use an enormous amount of decorative metal work including metal paneling and stripping, grilles and miscellaneous metal work for the dining rooms, staircases, promenade decks, corridors and swimming pools. The decorative metal work contract which was valued at about £15,000 is almost completed.—A. E.

Electrically heated and controlled stereotype pots recently completed ten years of successful operation, the first equipment having been built by the **General Electric Company** of Schenectady, N. Y., and put into operation in the plant of the **Waterbury Republican-American** late in 1925.

Aluminum plated cans are now being supplied for beer containers to the brewing industry by the **Crown Cork and Seal Company,** Baltimore, Md. The aluminum coating which is applied to the steel prior to fabrication into cans, will be 0.0001" thick.

In the recent Safety Contest held by the **National Safety Council,** in the Rolling, Finishing and Fabricating Division Group A, the **Aluminum Company of Canada, Ltd.,** Toronto, Ont., Can., took the first place; **Chase Brass and Copper Company,** Waterbury, Conn., second. In the Rolling, Finishing and Fabricating Division Group B, **Revere Copper and Brass, Inc.,** Baltimore Division, Baltimore, Md., was one of the eight firms which had perfect records.

According to information from the **International Nickel Company,** 67 Wall Street, N. Y., the oldest coin in existence is a Bactrian piece attributed to 235 B. C. It was hammered from a crude copper-nickel alloy of Chinese origin. In 1857 the United States substituted for its copper pennies, an alloy of 88% copper and 12% nickel, thus becoming one of the first nations in modern times to use nickel as a coinage metal. This alloy was changed in 1865 to 75% copper and 25% nickel, the composition still used in the United States "nickel" or five-cent piece.

Charles B. Bohn, president, Bohn Aluminum and Brass Corporation, Detroit, Mich., states that automobile engineering is lagging behind metallurgy; that materials are now available which, if properly employed, would make obsolete the current method of car design and give far better performance and greater economy.

Remote registration of weight will be demonstrated by the **Toledo Scale Company,** 3216 Monroe Street, Toledo, Ohio, at the coming Chemical Show in New York. Any visitor will be welcome to step on the scale which will do the weighing but will have a blank dial. His weight will be registered by electrical transmission on a printweigh scale across the booth.

The litigation between the **Baush Machine Tool Company** of Springfield, Mass., and the **Aluminum Company of America** in which the former sought $9,000,000 damages from the latter, has been settled through the filing of a stipulation in the Federal Court at New Haven, Conn.

The **Second Annual Marine Exhibition** was held under the auspices of the Maritime Association of the Port of New York, November 12 to 20, 1935, at the Maritime Exchange Building, 80 Broad Street, New York.

It included displays of every variety of materials and supplies used in shipping. There were also very interesting and beautifully made models of ships. It is always a pleasure to go to a Marine Exhibition because of the large showing of non-ferrous metals which are indispensable in marine construction and marine fittings. Among the exhibitors were Eagle-Picher Sales Company, 420 Lexington Avenue, New York, and Revere Copper and Brass, Inc., 230 Park Avenue, New York.

The **20th Annual National Hotel Exposition,** held in New York at Grand Central Palace, November 18-22 was replete with metal products and metal finishes. The equipment shown included metal and plated furniture, metal decorations, kitchen installations, kitchen utensils, silverware (solid and plated), metal cleaners and polishes and air conditioning installations.

Among the firms exhibiting were Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., (washing machines); J. B. Ford Sales Company, Wyandotte, Mich., (cleaners); International Nickel Company, 67 Wall Street, New York, (Monel metal for kitchen equipment); Matchless Metal Polish Company, Glen Ridge, N. J., (metal polishes).

Baker Platinum Plant in Canada

Baker Platinum of Canada, Limited is the Canadian branch plant of the world-wide organization of Baker & Company, Murray and Austin Streets, Newark, N. J. The London House—Baker Platinum Ltd. is now a very important factor in this field in Great Britain and on the Continent. In addition, there are plants in Paris and other cities. Among the articles made are the following: platinum sheet and wire; gold sheet and wire; solders for plati-

Corporation Earnings

Net profit unless followed by (L) which is loss

	Third Quarter 1935	Third Quarter 1934
Anaconda Copper Mining Company	$2,641,270	Not Available
Anaconda Copper Mining Company (nine months)	7,856,153	Not Available
Cleveland Graphite Bronze Company (nine months)	1,038,470	502,210
International Nickel Company of Canada, Ltd.	7,742,585	4,005,166
International Nickel Company of Canada, Ltd. (nine months)	18,080,817	14,017,808
New Jersey Zinc Company	1,168,003	746,637
New Jersey Zinc Company (nine months)	3,342,216	2,833,149
Reynolds Metals Company	266,058	295,716
Reynolds Metals Company (nine months)	828,367	1,217,083

num with melting points from 1000° C to 1700° C; gold solders, furnished in wire, sheet, cut and grains; settings and findings; wedding ring blanks; Rhodanizing.

Metals in Architecture Exhibition

How the modern architect uses metals and alloys for building construction, for doors, grilles, railings, and other details, and for decoration and ornamentation is being shown in the "Metals in Architecture" exhibition by the architects of world-famous buildings now being held in the Metal Products Exhibits—the permanent exhibition of metals, alloys, plastics, and finishes in the International Building, Rockefeller Center, New York. The exhibition is open to the public from 10 A. M. to 6 P. M. daily except Sunday. Admission is free.

Among the metals whose use are illustrated are stainless steel, aluminum, chrome steel, deplated aluminum, baked enamel, bronze Benedict nickel and cast aluminum.

Business Items-Verified

Revere Copper & Brass, Inc., displayed an exhibit at the second annual Marine Exhibition, held at the Maritime Exchange Building, 80 Broad Street, New York, November 12-20, 1935. They featured condenser plates and condenser tubes and also showed samples of other parts, such as shafting, sheet metals, die pressed and hammered forgings, welding rods and the application of copper water tube and streamline fittings to marine work.

American Foundry Equipment Company, 555 Byrkit Street, Mishawaka, Ind., is shipping several interesting wheelabrator jobs to Russia on a recent purchase of the Amtorg Trading Corporation.

National Can Company, Inc., is proceeding with a reconstruction program at its plants in Baltimore, Md. The aggregate cost of plant improvements and reconstruction will exceed $500,000. **Brown and Matthews,** 122 E. 42nd Street, New York, are the general contractors.

Progress Vacuum Cleaner Corporation, Cleveland, Ohio, recently organized, has leased space at East 40th Street and Kelley Avenue, for production and assembling work. The company plans expansion in the manufacture of a vacuum cleaner and air purifier (cylinder type on wheels) under license of a well known European company making and selling this type of equipment for many years in Europe.

Roller-Smith Company, 233 Broadway, New York, announces the appointment of the **Harris-Green Company,** Farmers Bank Building, Pittsburgh, Pa., as its district sales agent for Western Pennsylvania, Eastern Ohio and West Virginia.

American Nickeloid Company, Peru, Ill., announces the appointment of **George L. Starr,** 330 Bay Street, Toronto, 2, Ont., Can., and **Gordon L. Elmslie,** 660 St. Catherine W., Montreal, Que., Can., as Canadian representatives for the sale of nickel, chrome, brass and copper coated sheets.

New Jersey Metals Corporation, has purchased plant at 712 Rockefeller Street, Elizabeth, N. J., and will operate a plant for the refining of metals. **Samuel Kerzner** is president.

Aluminum Industries, Inc., Cincinnati, Ohio, has purchased the assets of the **Dall Manufacturing Company, Inc.,** Cleveland, in order to acquire facilities for manufacturing cast iron pistons for automotive and industrial use. **L. A. Dall,** formerly president of the Dall company will be affiliated with Aluminum Industries in an executive capacity.

J. R. Clancy, Inc., Syracuse, N. Y., manufacturers of hose clamps and other types of hardware, are now being operated under new management. The new executives are **C. E. Tompkins,** President, and **George L. Scherrer,** Secretary and Treasurer.

American Furnace and Foundry Company and affiliated company, the American Boiler and Foundry Company, resumed operations September 3 with five and six-day week schedule to the close of the year. This firm operates the following departments: brass, aluminum foundry; grinding room and lacquering.

New Jersey Zinc Company, 160 Front Street, New York, has approved plans for addition to plant at Palmerton, N. J., including furnace units. Improvements will also be made in present plant. Cost close to $60,000 with equipment.

Advance Tool and Die Casting Company, 3760 North Holten Street, Milwaukee, Wisc., is taking bids for machine shop addition, ell-shaped, 35 x 120 and 30 x 50 ft., to cost $20,000 with equipment.

Reliable Pattern and Castings Company, 3530 Spring Grove Avenue, Cincinnati, Ohio, is planning to move its new building at above address. This firm operates the following departments: bronze, brass and aluminum foundry; brass machine shop, wood and metal pattern shop.

The **Automatic Sprinkler Corporation,** will move its principal executive offices to Youngstown, Ohio, from Cleveland, the first of the year upon completion of remodeling and enlargement of the Youngstown offices. Youngstown is the center of the company's supply sources. This firm operates the following departments: brass, machine shop, tool room, fabricating pipe and fittings, valves, hangers, etc.

Aluminum Specialty Company, Manitowoc, Wisc., has placed general contract for extension, 60 x 75 feet, two stories and basement to present factory, 60 x 300 feet, at branch works in Chilton, Wisc. Additional equipment for utensil production will be installed. Charles Krug is vice-president and Chilton manager. This firm operates the following departments: tool room, spinning and stamping, and is in the market for a No. 3½ A Bliss toggle press.

Brass Products Manufacturing Company, Cleveland, Ohio, recently organized, has leased building at 10101 Quincy Avenue, S. E., Cleveland, for manufacture of line of brass goods. An option has been taken to purchase property. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop.

Metal Spray Company, 113 Llewellyn Street, Los Angeles, Calif., have been manufacturers and distributors of metal spray guns and equipment for the past five years. They have now been succeeded by the Metalspray Company, Inc. at the same address. J. C. Martin, Jr., has been elected president. H. B. Rice, who has been identified with the industry for five years and was previously for many years district manager for the Oxweld Acetylene Company, has been elected vice-president. An expansion program has been approved and is being put into effect immediately.

Kennecott Copper Corporation, 120 Broadway, New York, has purchased all the issued and outstanding stock of the American Electrical Works, Phillipsdale, R. I. The operating and sales officials of the latter company remain unchanged.

Wiley Displays, Inc., Hertel and Elmwood Avenues, Buffalo, N. Y., has been incorporated to produce metal display signs of various types. Roy W. Wiley, former head of the Flexlume Corporation, is president. Wallace K. Wiley is associated with his brother in operation of the new firm. The following departments are operated: tinning and soldering.

Plans for the organization of the **Whitehead Metal Products Company of Canada, Ltd.,** and installation at Port Colborne, Ontario, of facilities for the manufacture of monel metal hot water tanks were announced today by **J. C. Nicholls,** assistant to the president of

The International Nickel Company of Canada, Limited. The commercial production of monel metal tanks with capacities between 25 and 150 gallons has been made possible by a patented electric welding process. The Canadian company now being organized will be a wholly owned subsidiary of International Nickel.

A. Brickman, representing the importing house of B. Herzog, Rio de Janeiro, is shortly to return to Brazil, and invites correspondence with manufacturers interested in introducing their line on the Brazilian market. Kindly communicate with A. Brickman, 2313 E. 23rd Street, Brooklyn, N. Y., or directly with B. Herzog, Rua General Camara, 211/213, Rio de Janeiro.

Crown Rheostat & Supply Co., 1910 Maypole Ave., Chicago, Ill., have added to their force, **C. E. Clindinin,** who will be in charge of the laboratory and service work including the testing of solutions and actual field service work. Mr. Clindinin is a graduate chemist, with a Bachelor of Science Degree, who specialized in electrochemistry and for the last several years has been in charge of plating in one of the very large production plants in the automotive industry. They have also added to their sales force **C. E. Stiers.**

Information is wanted of **Louis Weinfeld,** 45 years of age, 5 ft. 2 in. tall, weighs about 120 pounds, dark hair, long nose, native of Galicia, a tinsmith by trade. This man disappeared in 1929 and has not supported his son Leonard, since that time. Anyone knowing of his whereabouts is requested to communicate with the National Desertion Bureau, 67 West 47th Street, New York City.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

Due to the sudden illness of **W. R. Brooks,** our Waterbury correspondent, we are forced to omit the news for Waterbury this month.

We regret this unfortunate circumstance but the news will be brought up to date in our January, Annual Review Number.—Ed.

Providence, R. I.

December 2, 1935.

Payroll distributions in Rhode Island industries during October were larger than any month in five years, according to statistics announced a few days ago by the Brown Bureau of Business Research. All industries in the State shared in the October gains from a year ago and all industries reported increased payrolls as compared with September with the single exception of the nonferrous metal group, for which a 3.5 per cent loss was reported, notwithstanding that this group showed a gain of 45.6 per cent as compared with the aggregate of October, 1934. In the manufacturing jewelry and silverware industries, which are enjoying the best autumn season experienced since 1929, last month's payrolls was a substantial gain being 15.4 per cent larger than those of the preceding month and 20.7 per cent larger than the October, 1934, was disbursements. The total payrolls of these industries amounted to $1,243,026.

The fact that five manufacturing jewelry concerns of Providence were fined a few days ago on charges involving violations of the State labor laws in working employees more than the weekly and daily limits has emphasized the necessity of a "seasonal" labor law whereby the jewelry industry may be permitted to work such hours as are required in filling the "rush" and "seasonal" orders. The complaints were brought by **State Director of Labor L. Metcalfe Walling** before **Judge Maurice Robinson** in Sixth District Court. Mr. Walling told the court that although the violations occurred during the so-called rush period incidental to the industry, there was no choice but to bring charges of violating the 54-hour week law and the 10-hour day law. Each of the respondent concerns was fined $20 and costs on one separate charge and additional charges were discontinued on payment of costs, Director Walling stating that he would be satisfied by such disposition.

The New England Manufacturing Jewelers' and Silversmiths' Association has prepared a booklet containing a list of its members with addresses and telephone numbers. It also contains a list of the kind of product of each member and the approximate retail selling price.

Industrial payrolls in Attleboro for the month of September increased 20.8 per cent over the corresponding month a year ago. The nine months of the present year showed an increase over the similar period of 1934 of 13.5 per cent.

The November regular meeting of the **Metal Finding Manufacturers' Association** was held in a private dining room at the Narragansett Hotel on Wednesday, November 6 with a good attendance. Following a luncheon, a brief business meeting was held. At the previous meeting the president was authorized to appoint a commttee of three to consider matters pertaining to apprentices and other learners and in accordance with this vote the chair named the following: **Mr. Jenks** of the **D. M. Watkins Company; Frederick A. Ballou, Jr.,** of **B. A. Ballou Co.** and **Frank E. Farnham** of the **Jewelers' Supply Company.**

In accordance with the by-laws of the **New England Manufacturing Jewelers' and Silversmiths' Association** the Board of Directors with the inclusion of the eight new members elected at the annual meeting of October 24 met one week later and re-elected **Sturgis C. Rice** of Plainville, president for a second year. **Edward O. Otis, Jr.** was re-elected executive secretary for another year. The other officers include: **Frederick A. Ballou** of Providence, **Donald LeStage** of North Attleboro and **Harold E. Sweet** of Attleboro, vice presidents; **Lewis E. Chilton** of Attleboro, treasurer; **Edgar E. Barker** of Providence, secretary. The eight new directors are: **Walter A. Griffith** of Providence; **Earl H. Ashley** of Providence; **Dean Baker, Jr.** of Attleboro; **Edmund H. Cummings** of Attleboro; **Stephen H. Garner** of Attleboro; **William G. Lind** of Providence; **Russell I. Rhodes** of Attleboro Falls and **Gottleib Armbrust** of Providence.

George Gurdjian, Frederick Gurdjian and **Autranik Gurdjian** are the owners of the **American Co-operative Jewelry Manufacturing Company,** 162 Chestnut Street.—**W. H. M.**

Middle Atlantic States

Newark, N. J.

December 2, 1935.

Plans are being made to reorganize two large New Jersey companies, one the **American Type Founders Co.,** of Elizabeth, with assets of $6,630,000, and the other the **Gold Seal Electrical Co.,** of East Newark, with assets of $643,596. A Special Master had filed with **Federal Judge Fake** an approval of a reorganization plan submitted in behalf of the type founders company and the latter will hear argument on the same. Judge Fake will hear argument on the adoption or rejection of a submitted plan.

The **Delco-Remy Corp.,** a division of **General Motors,** has purchased a plant at Bloomfield for additional manufacturing of batteries.

Whitaker, Clark & Daniels, manufacturers of chemicals, have purchased a factory at Kearny and will expand their business.

Following Newark concerns have been incorporated: **Samson Products Corp.,** hardware, 2,500 shares, no par; **Academy Metal Ceiling Co., Inc.,** 1,000 shares, no par; **Federal Bronze Products Co.,** metal products, 250 shares, no par.

C. A. L.

Trenton, N. J.

December 2, 1935.

Walter O. Lochner, Secretary of the **Trenton Chamber of Commerce,** announces that Trenton industries are now employing 50 per cent more men than were given work during the low days of 1933. Employment in New Jersey factories increased 2.8 per cent from August to September and weekly payrolls increased 2.3 per cent during the same period, according to **John J. Toohey,** State Commissioner of Labor. There were 229,130 workers with total weekly earnings of $5,147,276 employed in 752 establishments in 56 of the principal manufacturing industries of the State during September, it was announced.

Following concerns have been chartered here: **Home Pioneer Corp.,** electrical devices, Passaic, 2,500 shares, no par; **Linden Chemical Co., Inc.,** Elizabeth, 100 shares, no par; **Leyes Chemical Corp.,** Jersey City, 500 shares, no par; **Republic Razor Blades,** Elizabeth, cutlery, 100 shares, no par.

C. A. L.

Middle Western States

Toledo, Ohio

December 2, 1935.

With the revival of the motor car industry, great impetus has been given to most lines of industry in this city and other near-by manufacturing areas. Reports from Cleveland show conditions are about the same there as here in Toledo where the accessory plants are operating to capacity and finding it difficult to keep up with demands.

The plating industry is becoming more active from week to week. Many of the plating plants here are busy on other work than that incident to the motor car. These plants, many of them operated as departments of industries covering a wide range of products, have promise of work extending well along into the winter and perhaps into the early spring.

As might be expected, the demand for skilled labor is steadily increasing, but there still is a surplus of unskilled workmen. This should be taken into consideration by outside labor when considering a move into any of the industrial areas bordering on the Great Lakes.—**F. J. H.**

Detroit, Mich.

December 2, 1935.

Industry in the Michigan area and particularly Detroit, is rapidly rising out of the slough of the late depression. Manufacturing of all kinds, especially in the non-ferrous metals, has been more active within the last 30 days than at any time in the last five years.

Most of the motor car manufacturers are under heavy production, spending money freely for raw materials and giving employment to thousands of persons, and it looks now as if this were to be the rule through most, if not all, the coming winter.

This early resumption of production has extended into numerous other lines dependent on the motor industry, and these too are beginning to surge forward as they have not since 1929. Most of the accessory plants in Detroit and surrounding areas have contracts extending ahead for a long time.

Platers are particularly busy, and struggling to keep up with demands from their automotive customers.

Encouraging reports also come from manufacturers of refrigerators. No indication of a decline for such equipment seem to be in sight. All plants in Detroit and out in the state, are operating to capacity.

With the increase in building, greater demands are being made on manufacturers of plumbing and steam fitting supplies. While production is far from what it should be, it is showing gratifying increases and still better things are expected for the near future.

United Platers, 994 Madison Ave., Detroit, has recently been incorporated by Glenn H. Friedt, of Grosse Pointe Park, a suburb. The capital stock is $10,000.

The $4,000,000 suit of the **Sheet Aluminum Corporation,** of Jackson, Mich. against the **Aluminum Company of America,** was dismissed recently by **Federal Judge Fred M. Raymond.** The Jackson organization had charged that the Aluminum Co. had created a monopoly in violation of the anti-trust laws. Damages of $4,125,000, three times the amount of actual damages, were asked by the plaintiff. The action was started last May 14. **Stewart E. Knappen,** attorney for the Sheet Aluminum Corporation, said that the suit was dismissed following the arrival at a compromise and settlement of damages. Terms of the settlement were not revealed according to an article in the Detroit News.

Directors of the **Parker Rust Proof Company,** at a recent meeting authorized consolidation of the **Metal Finish Research Corporation** of Detroit with the **Parker Company,** it is announced. In the consolidation, it is stated, the Parker Company acquires all the assets of the Metal Finishing Research Corporation in exchange for Parker stock on the basis of one share of Parker common for each three and one-fifth shares of Metal Finishing Research Corporation common.—**F. J. H.**

Pacific States

Los Angeles, Calif.

December 2, 1935.

The **General Electric Company** is building a large foundry at their Hot Point plant at Ontario, near here, making electric irons and other appliances.

The **Pacific Signal Company** of Linwood has opened a factory for the making of electric lanterns for railroads, contractors, farmers, etc., which burns 240 hours flashing, visible a mile.

The **Ward Heater Company** of 1800 West Washington St., are making an electric ice cube cutter for hotels and other places, cutting 600 to 1,500 cubes an hour.

The **Consumers Refrigerator Manufacturing Company** of 1020 E. 59th St., are making a new quick ice cream freezer and fruit juicer.

C. L. Michael and **C. L. Wetman,** of the **Challenge Ice Cream & Butter Association,** of 925 East 2d St., have invented and are manufacturing an aluminum butter churner, instead of wood, as it is cleaner, more sanitary and noiseless.

The **Western Washer & Manufacturing Company,** a subsidiary of the **Wrought Washer Company** of Milwaukee, have bought a factory here at 2111 East 51st St., to make all kinds of metal washers, stamping and other metal lines.

The **Reese Patents Corporation** have invented and are manufacturing an egg breaking machine, to break and separate white and yolk of the eggs, at the rate of 3,500 eggs an hour.

R. J. Fisher has opened a brass castings plant at 5332 Santa Fe Ave.—H. S.

North Pacific

December 2, 1935.

The **Aeriol Burner Company** of 469 Bryant St., San Francisco, are manufacturing a new fire gun flame thrower, to rid places of pests and insects.

Nesix, Inc., 390 First St., San Francisco, are making an aluminum auxiliary heater, weighing only five pounds, to radiate heat over a radius of 180 degrees.

Renco, Inc., is a new firm, making gas regulators at 116 New Montgomery, San Francisco.

The **Modern Iron Works,** have opened a new plant at 2247 Folsom St., San Francisco, Paul Alah, manager. They will make bronze, aluminum, decorative ornamental iron for buildings.

The **National Government** has plans ready for a new mint at 7th and Mission Sts., San Francisco, to be a 4-story building, 207 x 185 feet in size, to cost $1,225,000. It will have all new minting, melting, refining shops, machine shop and laboratory.—H. S.

Metal Market Review

December 2, 1935.

Copper was unchanged throughout November at 9.25 cents per pound for electrolytic. It fluctuated abroad without changing American prices which were unmoved in the face of rather slow buying for the first three weeks. During the last week, however, activity increased considerably and the market presented a firmer appearance.

Sales of copper in October were between 55,000 and 65,000 tons, larger than for any month since 1931. Sales in November were considerably less, between 26,000 and 30,000 tons, but the undertone at the close of the month was decidedly on the firm side.

Sales abroad have been heavy, due to some extent to shipments to Italy. According to newspaper reports copper shipments from Baltimore to Italy have also been unusually heavy.

Zinc was also firm throughout under the influence of encouraging statistics, a good trade situation and heavy sales in the second week, (amounting to more than 20,000 tons). Shipments for October totalled over 47,000 tons, the largest monthly total since October, 1929 and stocks on hand have decreased to less than 96,000 tons, the lowest point since February, 1930.

Tin is in a rather peculiar situation. Spot metal is scarce but the market for futures is depressed because of the larger production quotas which will result in increased supplies in the near future. Spot prices ranged from 51.75 to 53c per lb. and closed at 51.25. Futures are as much as 3c lower. Demand has been fair throughout.

Apparent consumption of tin for the world during the first 9 months of 1935 was 104,443 long tons against 88,341 long tons for the same period of 1934. American consumption for the same periods was 56,771 long tons in 1935 against 46,733 long tons in 1934.

Lead was unchanged at 4.35c per pound, F.O.B. St. Louis. Demand was good throughout. October shipments were 42,271 tons against 34,809 tons per month average for the first 10 months of the year.

Aluminum was, as usual, unchanged at 22c per pound.

Nickel was also, as usual, unchanged at 35c per pound electrolytic.

Antimony suffered a slight relapse. Beginning the month at 16.35c per lb., it dropped sharply, immediately afterward, to 15.50, where it stayed until November 21st. It then slipped back another notch to 14.75, where it closed. American antimony closed at 13.75.

Silver has become one of the metals about which there is no longer any news, market-wise. It spent another whole month at its post at 65.375c per ounce. Early in the month China nationalized its silver presumably to stabilize its currency and perhaps also to keep it from leaving the country. Rumor has it that the United States Treasury support is still responsible for the present price level.

Platinum rested comfortably throughout the entire month at $36.00 per ounce.

Gold: official Treasury price, unchanged at $35.00 per ounce.

Scrap Metals were active. During the first week of November offerings were heavy with brass ingot demand quiet and secondary aluminum demand strong. This condition continued during the second week and also during the third. In the last week, offerings of copper scrap declined and prices for aluminum scrap slipped slightly.

The orders for brass ingot were light, making November a much poorer month than October. The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute for the month of October, 1935, amounted to a total of 6,294 tons, 1,099 tons ahead of September and the largest total since May.

Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on Commercial Grades of six principal mixtures of Ingot Brass during the twenty-eight day period ending November 1.

Commercial 80-10-10 (1½% Imp.)	10.375c
Commercial 79% Metal	8.106c
Commercial 81% Metal	8.530c
Commercial 83% Metal	8.602c
Commercial 85-5-5-5	8.903c
Commercial No. 1 Yellow Brass	7.192c

WROUGHT METAL MARKET

Connecticut Valley mills have been busy as seasonal demands for their materials have held up well. The change in the date of the Automobile Show has resulted in very much improved prospects for the fall for the western mills. A prominent New York distributor of brass and bronze sheet reports that November business was at about the same level as October, and 25 per cent above November, 1934. Prospects for the immediate future are very good.

Daily Metal Prices for November, 1935

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	5*	6	7	8	11*	12	13	14	15	18
Copper c/lb. Duty 4 c/lb.												
Lake (del. Conn. Producers' Prices)	9.375	9.375	....	9.375	9.375	9.375	....	9.375	9.375	9.375	9.375	9.375
Electrolytic (del. Conn. Producers' Prices)	9.25	9.25	....	9.25	9.25	9.25	....	9.25	9.25	9.25	9.25	9.25
Casting (f.o.b. ref.)	8.95	8.95	....	8.95	8.95	8.95	....	8.95	8.95	8.95	8.95	8.95
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¼ c/lb. Prime Western (for Brass Special add 0.05)	4.85	4.85	....	4.85	4.85	4.85	....	4.85	4.85	4.85	4.85	4.85
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	51.75	51.75	....	52.50	52.00	52.75	....	53.625	53.00	52.75	52.25	52.00
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	4.35	4.35	....	4.35	4.35	4.35	....	4.35	4.35	4.35	4.35	4.35
Aluminum c/lb. Duty 4 c/lb.	22.00	22.00	....	22.00	22.00	22.00	....	22.00	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.00	35.00	....	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	16.375	15.50	....	15.50	15.50	15.50	....	15.50	15.50	15.50	15.50	15.50
Silver c/oz. Troy, Duty Free	65.375	65.375	....	65.375	65.375	65.375	....	65.375	65.375	65.375	65.375	65.375
Platinum $/oz. Troy, Duty Free	36.00	36.00	....	36.00	36.00	36.00	....	36.00	36.00	36.00	36.00	36.00
Gold—Official Price[1] $/oz. Troy	35.00	35.00	....	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00	35.00

	19	20	21	22	25	26	27	28*	29	High	Low	Aver.
Copper c/lb. Duty 4 c/lb.												
Lake (del. Conn. Producers' Prices)	9.375	9.375	9.375	9.375	9.375	9.375	9.375	....	9.375	9.375	9.375	9.375
Electrolytic (del. Conn. Producers' Prices)	9.25	9.25	9.25	9.25	9.25	9.25	9.25	....	9.25	9.25	9.25	9.25
Casting (f.o.b. ref.)	4.85	4.85	4.85	4.85	4.85	4.85	8.95	....	8.95	8.95	8.95	8.95
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¼ c/lb. Prime Western (for Brass Special add 0.05)	8.95	8.95	8.95	8.95	8.95	8.95	4.85	....	4.85	4.85	4.85	4.85
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	51.50	51.00	51.20	51.00	51.00	51.25	51.25	....	51.25	53.625	51.00	51.879
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	4.35	4.35	4.35	4.35	4.35	4.35	4.35	....	4.35	4.35	4.35	4.35
Aluminum c/lb. Duty 4 c/lb.	22.00	22.00	22.00	22.00	22.00	22.00	22.00	....	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.00	35.00	35.00	35.00	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	15.50	15.50	14.75	14.75	14.75	14.75	14.75	....	14.75	16.375	14.75	15.299
Silver c/oz. Troy, Duty Free	65.375	65.375	65.375	65.375	65.375	65.375	65.375	....	65.375	65.375	65.375	65.375
Platinum $/oz. Troy, Duty Free	36.00	36.00	36.00	36.00	36.00	36.00	36.00	....	36.00	36.00	36.00	36.00
Gold—Official Price[1] $/oz. Troy	35.00	35.00	35.00	35.00	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00

[1] U. S. Treasury price. * Holiday.

Metal Prices, December 2, 1935

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 9.375, Electrolytic, 9.25, Casting, 8.95.
Zinc: Prime Western, 4.85. Brass Special, 4.95.
Tin: Straits 51.50. Pig 99%, 50.00.
Lead: 4.35. **Aluminum,** 22.00. **Antimony,** 16.375.
Nickel: Shot, 36. Elec., 35.

Quicksilver: Flasks, 75 lbs., $75.00. **Bismuth,** $1.00.
Cadmium, 85c-$1.00. **Silver,** Troy oz., official price, N. Y. December 2, 65¾c. **Gold:** Oz. Troy, Official U. S. Treasury price, December 2, $35.00. **Scrap Gold,** 6¾c. per pennyweight per karat, dealers' quotation. **Platinum,** oz. Troy, $36.00.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free, lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U S. Import Duty	U S. Import Tax*
No. 1 Yellow Brass	7.50	None	4c. lb.[1]
85-5-5-5	9.25	None	4c. lb.[1]
88-10-2	12.25	None	4c. lb.[1]
80-10-10	10.75	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	9.50	None	4c. lb.[1]
Aluminum Bronze	13.75	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a.v.	None
Nickel Silver (12% Ni)	11.50	20% a.v.	4c. lb.[1]
Nickel Silver (15% Ni)	15.00	20% a.v.	4c. lb.[1]
No. 12 Aluminum	16.50-20	4c. lb.	None
Manganese Copper, Grade A (30%)	18-23	25% a.v.	3c. lb.[1]
Phosphor Copper, 10%	11.25-14	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	13.25-15	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	18.30	45% a.v.	4c. lb.[1]
Phosphor Tin, no guarantee	61-75	None	None
Iridium Platinum, 5%	$37-38.50	None	None
Iridium Platinum, 10%	$38-39.50	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	6¾ to 7	Free	4c. per pound on copper content
Light copper	6 to 6¼	Free	
Heavy yellow brass	4⅛	Free	
Light brass	3¼ to 3⅜	Free	
No. 1 composition	6	Free	
Composition turnings	5⅞	Free	
Heavy soft lead	3⅝ to 3¾	2⅛c.lb.	None.
Old zinc	2.75 to 2.85	1½c.lb.	
New zinc clips	3.60 to 3.70	1½c.lb.	
Aluminum clips (new, soft)	14 to 14.25	4c.lb.	
Scrap aluminum, cast	12 to 12.25	4c.lb.	
Aluminum borings—turnings	6¼ to 6½	4c.lb.	
No. 1 pewter	30 to 31	Free	
Electrotype	3¾ to 4	2⅛c.lb.*	
Nickel anodes	29½ to 31	10%	
Nickel clips, new	32 to 34	10%	
Monel scrap	13 to 19½	10% a.v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since October 9, 1935. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	16¼c.	2½c. lb.
Bare wire, soft, less than carloads	13 c.	25% a. v.
Seamless tubing	16¾c.	7c. lb.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	23⅞c.	10% Quality	26¾c.
15% Quality	26 c.	15% Quality	31⅛c.
18% Quality	27¼c.	18% Quality	34⅜c.

BRASS AND BRONZE MATERIAL

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	U. S. Import Tax
Sheet	14⅝c.	15½c.	16⅜	4c. lb.	4c. lb. on copper content.
Wire	15⅛c.	16 c.	16⅞	25%	
Rod	13⅛c.	16 c.	16¾	4c. lb.	
Angles, channels	22⅝c.	23¾c.	24⅜	12c. lb.	
Seamless tubing	16⅝c.	17¼c.	18⅛	8c. lb.	
Open seam tubing	22⅝c.	23¾c.	24⅜	20% a.v.	

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound.	(Duty 4c. lb.; import tax 4c. lb. on copper content.)
Tobin Bronze Rod	16¾c.
Muntz or Yellow Rectangular and other sheathing	17⅞c.
Muntz or Yellow Metal Rod	14¼c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb. 32.80
Aluminum coils, 24 ga., base price, ton lots, per lb. 30.50

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods ..... 50c. Cold Rolled Sheet ..... 53c.
Hot Rolled Rods ..... 44c. Standard Sheet ..... 48c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base) ... 34 Standard Sheets (base) 38
Cold Drawn Rods (base) .. 40 Cold Rolled Sheets (base) 43

SILVER SHEET

Rolled sterling silver (December 2) 66c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' price)	10.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' price)	14.25	2c. lb.
Full Lead Sheet (base price)	8.00	2¾c. lb.
Cut Lead Sheet (base price)	8.25	2¾c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over ..... 15c. above N. Y. pig tin price
100 to 500 lbs. ..... 17c. above N. Y. pig tin price
Up to 100 lbs. ..... 25c. above N. Y. pig tin price
Up to 100 lbs. ..... 25c. above N. Y. pig tin price

Supply Prices on page 458.

Supply Prices, December 2, 1935

ANODES

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 500 lbs. or more, and subject to changes due to fluctuating metal markets.

Copper: Cast	16¼c. per lb.	**Nickel:** 90-92%	.45 per lb.
Electrolytic, full size, 14¼c. cut to size	14¼c. per lb.	95-97%	.46 per lb.
Rolled oval, straight, 14½c.; curved,	15¼c. per lb.	99%+cast, 47c.; rolled, depolarized, 48.	
Brass: Cast	14¾c. per lb.	**Silver:** Rolled silver anodes .999 fine were quoted December 2, from 68¾c. per Troy ounce upward, depending upon quantity.	
Zinc: Cast	9⅜c. per lb.		

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.95/lb.	$2.65/lb.	$2.45/lb.
10-12-14 & 16	2 to 3½	2.85	2.55	2.35
6-8 & over 16	1 to 2	3.05	2.75	2.55
6-8 & over 16	2 to 3½	3.00	2.70	2.45
6 to 24	Under ½	4.25	3.95	3.75
6 to 24	½ to 1	3.95	3.65	3.45
6 to 24	Over 3½	3.35	3.05	2.85
	Any Quantity			
4 to 6	Under ½, $5.00	½-1, $4.85	1 to 3, $4.75	
1½ to 4	" 5.55	" 5.40	" 5.35	
1 to ½	" 5.85	" 5.70	" 5.60	

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick. On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$76.30
14" 20 ply 84/92 Unbleached	58.51
12" 20 ply 84/92 Unbleached	44.01
16" 20 ply 80/92 Unbleached	63.81
14" 20 ply 80/92 Unbleached	49.02
12" 20 ply 80/92 Unbleached	36.96
16" 20 ply 64/68 Unbleached	56.32
14" 20 ply 64/68 Unbleached	43.32
12" 20 ply 64/68 Unbleached	32.72
½" Sewed Buffs, per lb., bleached or unbleached	48c. to 1.12

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.13½-.16
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.05¼-.05¾
Chromic, 400 or 100 lb. drums		.16¼
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl, drums	lb.	.12½-.13½
Denatured, drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¾-.04
Powdered, barrels	lb.	.0390-.0415
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.0245-.0295
Cadmium oxide, 50 to 1,000 lbs.	lb.	.85
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	21½-23½
Chromic Sulphate, drums	lb.	.33-.55
Copper—Acetate (Verdigris)	lb.	.21
Carbonate, 53/55% cu., bbls.	lb.	.15½
Cyanide (100 lb. kgs.)	lb.	.38-.40
Sulphate, tech., crystals, bbls.	lb.	4.55-5c.
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs.,	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.13½
Oxide (Litharge), bbls	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums	gal.	.42½
Nickel—Carbonate, dry, bbls.	lb.	.35-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.09
Carbonate, 96-98%	lb.	.07⅝
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Gold Cyanide	oz.	$15.45*
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.08
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.53⅝
Cyanide, 100 oz. lots	oz.	.60-.65
Nitrate, 100 ounce lots	oz.	.45⅝
Soda Ash, 58%, bbls.	lb.	.0252
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17½-.22
Gold Cyanide	oz.	$17.10*
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.15-3.30
Nitrate, tech., bbls.	lb.	.02¼
Phosphate, tribasic, tech., bbls.	lb.	.0350
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.33½-.36½
Sulphocyanide, drums	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
*Tin Chloride, 100 lb. kegs	lb.	.38½
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11-.12
Cyanide (100 lb. kegs)	lb.	.38
Chloride, drums, bbls.	lb.	.07½-.10
Sulphate, bbls.	lb.	.028-.037

*Subject to fluctuations in metal prices.

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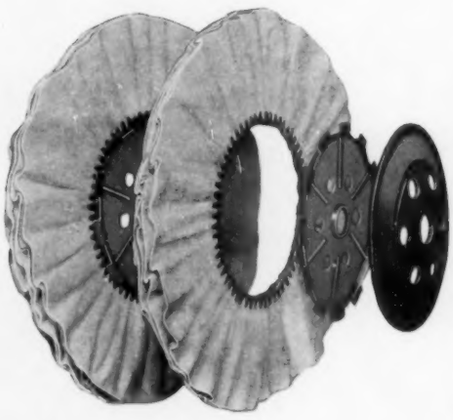

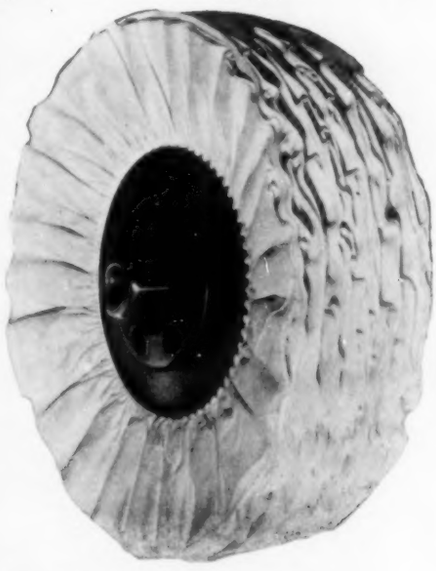

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The AIRWAY BUFF is used with metal center plates and flanges so arranged as to allow the centrifugal action of the buff to draw air in at the sides of the wheel and pump it out radially between the buff sections. This circulation of air through the AIRWAY keeps it cool under most severe operating conditions, entirely eliminates burning and thus prolongs the life of the buff.

Higher Speeds

AIRWAY cooling permits 50% to 100% higher speed. High speed keeps the edge of the cloth from turning over and rubbing, a condition obtained in all low speed buffing. Conventional buffs are sewed in various designs in an attempt to eliminate this condition but greater centrifugal force resulting from higher speed is the only method to accomplish this result perfectly. High speed results in longer wear, faster cutting, more production and less pressure on the operator's part. We recommend at least 12,000 surface feet per minute for the AIRWAY for cutting operations.

Compound Saving

The bias construction of the AIRWAY eliminates the pulling out of cross threads and thus saves compound.

The ventilating feature keeps the buff cool and reduces the tendency of the compound to melt and be thrown off.

The AIRWAY should not use more than 50% of the compound used with a conventional buff.

Other Advantages

The AIRWAY requires no raking, has a very fast cut and does not ridge the work. It is clean because there are no cross threads to pull out and the composition stays on the buff.

It has a wide face and usually two sections are equivalent to three of the conventional buff. This should be considered when comparing prices with conventional buffs.

Material Used

The material used in the AIRWAY BUFF is 84/92, unbleached sheeting. This is woven from extra tight twist thread into a firm, hard cloth which will hold a much better head of composition than the lower count cloths.

AIRWAY BUFFS made from 64/68 or other sheetings can be furnished but in most cases we have found that the 84/92 is better and generally cheaper in the long run.

The cloth is biased and so arranged in the AIRWAY BUFF that only the bias of the cloth is presented to the work being buffed. This makes for long life since there are no cross threads to pull off in operation as in the conventional buff.

Sizes

Standard stock sizes are 6″, 8″, 10″, 12″, 14″, 16″, 18″ and 20″ diameter. Special sizes can be furnished on short notice.

Center plates and flanges are furnished with center holes to suit customer's spindle diameters.

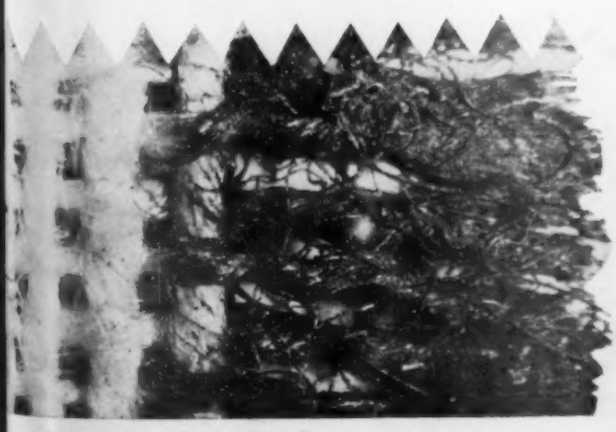
64/68

Unretouched Micro Photograph of cutting edge of conventional buff made of 64/68 construction.

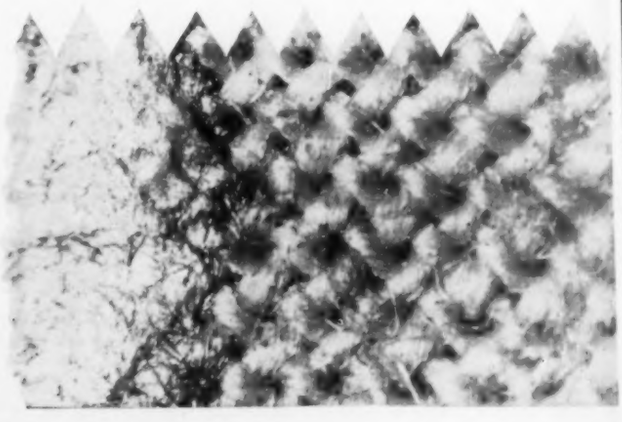
84/92

Unretouched Micro Photograph of cutting edge of AIRWAY BUFF made of 84/92 sheeting.

Notice bias construction—no threads to pull off. Notice fine well balanced construction of 84/92 sheeting and how composition heads up on ends of threads.



CUTTING EDGE



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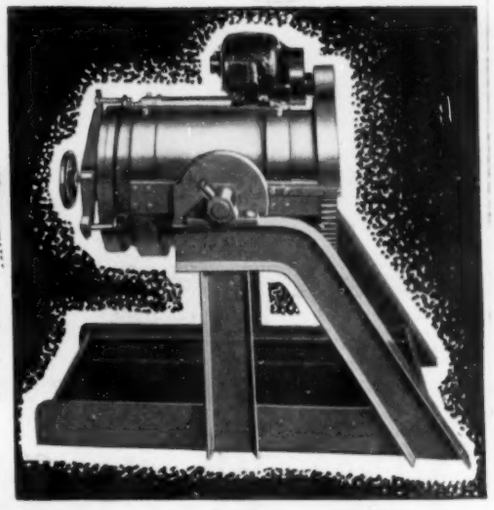

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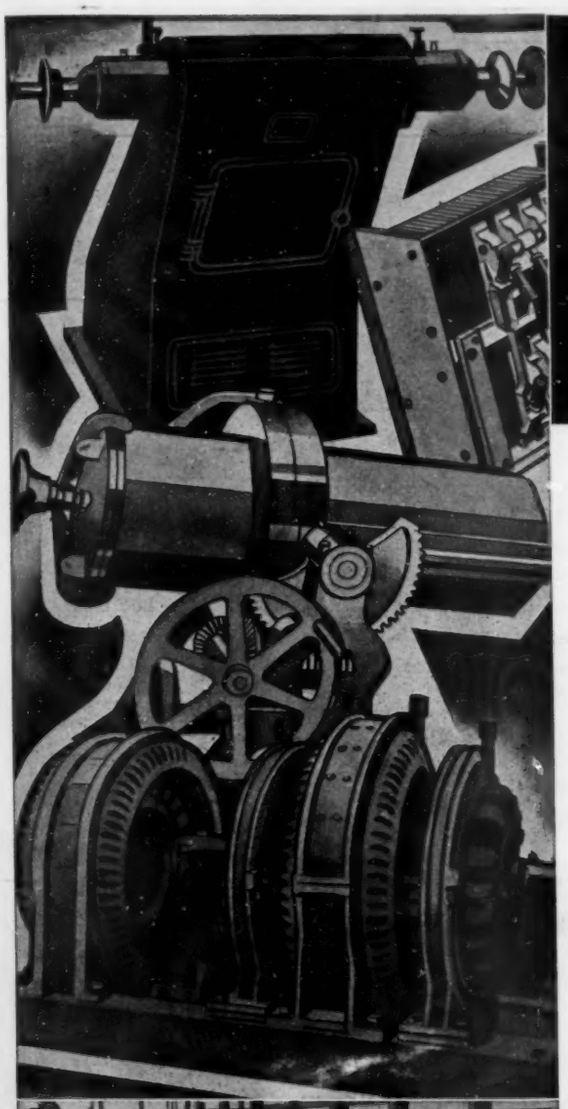

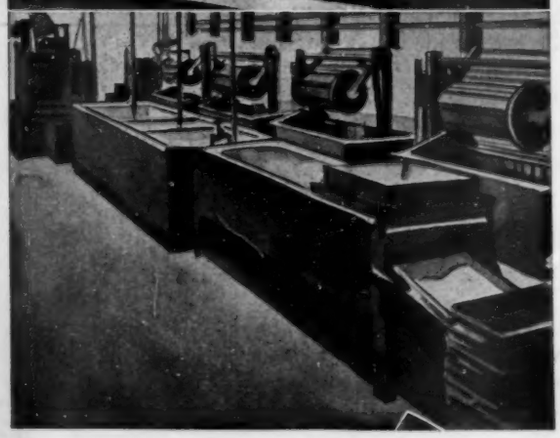

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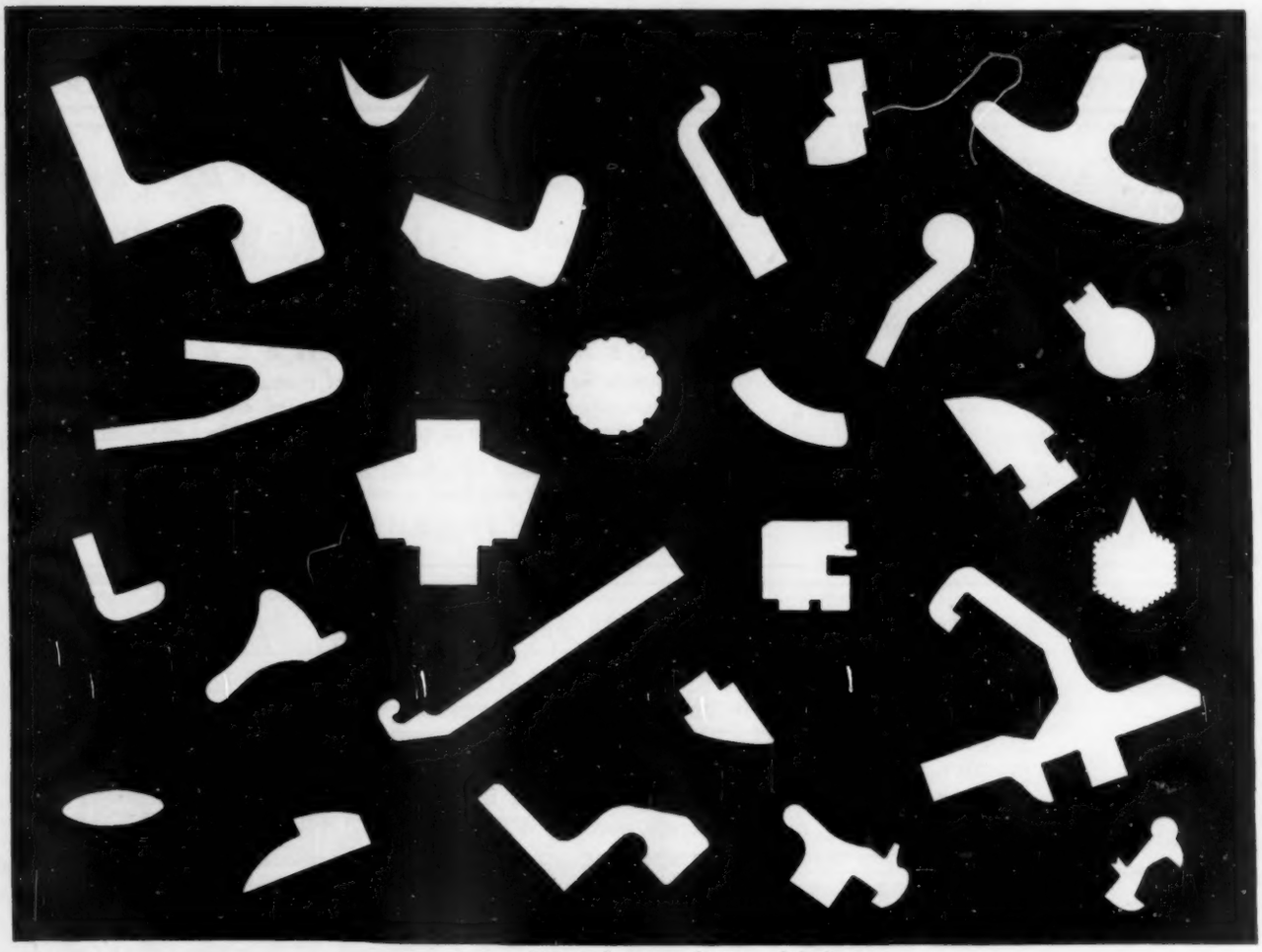

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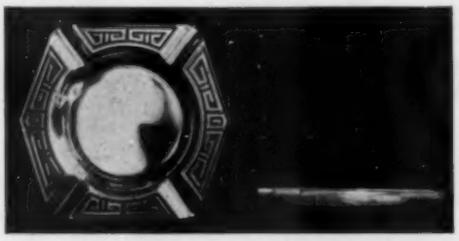

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1042-1050 De Kalb Avenue
Brooklyn, N. Y.

FOR SALE

PLATING AND POLISHING EQUIPMENT

1—2000 ampere, HVWM Motor Generator Set complete with full controlling apparatus and panel board equipment. Excellent condition.

1—750 ampere, 6 volt, HVWM Motor Generator Set, separately excited with direct connected exciter. With or without control panel board equipment. Excellent for small chrome job. Fully guaranteed.

60—Tank Rheostats—high voltage drop—especially applicable for precious metal plating.

"Electric Solution Heaters"—to prevent pitting and hard deposits resulting from plating in cold solutions.

Weston Meters—Any voltage or amperage up to 5000 amperes. Fully Guaranteed.

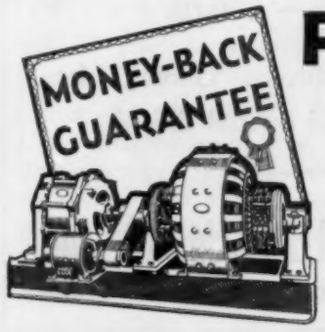
MANY OTHER ITEMS CARRIED IN STOCK

All Used Equipment reconditioned by factory-trained workmen and guaranteed to be in perfect operating condition.

PLATING PRODUCTS COMPANY

352 Mulberry Street Newark, N. J.

We Carry a Complete Stock of Plating and Polishing Supplies.



PLATING EQUIPMENT BARGAINS

Save 25% to 50% of your plant investment by installing Moreco Rebuilt Platers. Completely overhauled and tested to perform like new. Performance must satisfy or your money refunded. Moreco Rebuilt Platers are recommended by users over the whole world.

PRICED TO SAVE YOU MONEY

PLATERS

Amp.	Volts	Make	Speed
65	8½	Elec. Prod.	1750
100	6	H. & V. W.	1300
100	7½	Rochester	1750
100	7½	Hobart	1750
120/60	7½/15	Eager	1800
125	7½	Rochester	1800
150	6	Conn.	1500
200	7½	Hobart	1750
200	7½	Acme	1750
600	6	Conn.	1725
600/300	6/12	Giant	1350
750/375	6/12	H. & V. W.	1200
1000/500	6/12	Chromar	1200
1500/750	6/12	Eager	900
2000/1000	6/12	Chromar	900
3000/1500	6/12	Chromar	600
5000/2500	6/12	Eager	500

GRINDERS AND BUFFERS

H. P.	Make	Speed	
½	Gen. Elec	3600	230 volt, D. C. Bench Type
½	Dillon	3400	220 volt, D. C. Bench Type
½	Dillon	3400	115 volt, D. C. Bench Type
1	Willey	1800	220 volt, 1 phase, 60 cycle Buffer & Grinder
1	Dillon	3600	110/220 volt, 1 phase, 60 cycle Pedestal Buffer
1	Westinghouse	1725	220 volt, 3 phase, 60 cycle Grinder
1	Hisey	1750	220 volt, 3 phase, 60 cycle Grinder
1	Gen. Elec.	1150	220 volt, D. C. Pedestal Grinder
1½	Brown Brock	3450	110/220 volt, 1 phase 60 cycle Grinder
5	Safety Wheel	1740	220 volt, 3 phase, 60 cycle Pedestal Grinder

THE MOTOR REPAIR & MFG. CO.
1555 Hamilton Ave. Cleveland, Ohio.

USED BUFFS

64-68—1⅛" arbor—20 ply

Full disc—Loose—or Sewed

Thousands of every size.

8"—7c each **9"—8c each**

10"—10c each

MICHIGAN BUFF CO.

101 E. Baltimore Avenue Detroit, Mich.

Polishing and Plating Equipment Supplies

FOR SALE: New and used polishing and plating equipment and supplies. Three stores and one warehouse jammed with material at record breaking prices. Goods shipped the same day order is received.

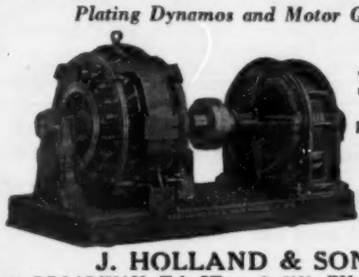
Lewis Roe Manufacturing Company
1042-1050 DeKalb Avenue,
Brooklyn, New York

BUSINESS WANTS

FOR SALE—EQUIPMENT, ETC.

Display Advertisements, One Column Wide, $3 per inch, Each Insertion

REBUILT AND GUARANTEED
POLISHING AND PLATING EQUIPMENT
Plating Dynamos and Motor Generator Sets



All Sizes Carried in Stock

Tumbling and Plating Barrels and most anything for the Plating Shop.

Largest Stock of Rebuilt Polishing and Plating Supplies in America

Let us have your requirements. Entire plants or parts thereof bought for cash. Send us list with prices.

J. HOLLAND & SONS, INC.
489 BROADWAY Tel. STagg 2-5128, EV. 7-8989 BKLYN., N. Y.

FOR SALE

10,000 Sections 6"—18 ply Loose Leaf Buffs, brand new at a very low price.

LEWIS ROE MANUFACTURING COMPANY
1042-1050 De Kalb Avenue
Brooklyn, New York

FOR SALE

SEMI-AUTOMATIC MEAKER NICKEL CONVEYOR TANK

30 ft. long, 36 in. wide, 33 in. deep (could be made deeper if necessary very easily), used very little and complete less motor cost over $2,000.00, will sell for $975.00 F.O.B. Detroit.

Surplus Equip't Dept.

AUTO CITY PLATING CO., INC.
DETROIT

FOR SALE

2—1000 ampere, 30 volt generators direct connected to 220 volt, 60 cycle, 3 phase, alternating current motors with exciters and starting compensators each $400.00. 1—600 ampere, 30 volt generator direct connected to 220 volt, 60 cycle, 3 phase, alternating current motor with exciter and starting compensator $300.00. 1—1500 ampere, 30 volt generator direct connected to a 220 volt direct current motor with starter and rheostat $450.00. A few other sizes and separate generators in stock.

Electrical Surplus Company
1885 Milwaukee Ave. Chicago

FOR SALE

5000 Brand New 12" Adamite cloth discs $5 per hundred in lots of two hundred or more. F.O.B. New York.

LEWIS ROE MANUFACTURING COMPANY
1042-1050 De Kalb Avenue
Brooklyn, New York

FOR SALE

One fully automatic Munning nickel plating machine.

Mueller Co., Purchasing Dept.
Decatur, Illinois

FOR SALE—Bargain price for quick disposal. One tilting crucible furnace for No. 400 crucible.

One tilting crucible furnace for No. 150 crucible. Interchangeable for gas or oil.

Address 400, care of Metal Industry.

INQUIRIES AND OPPORTUNITIES

For further particulars address METAL INDUSTRY, 116 John Street, New York City

Inquiry No. 4011.—Can you give us any information concerning a metal known as Mello—which we believe is a silver, copper and zinc composition.

Inquiry No. 4012.—We are interested in obtaining a list of manufacturers who make a mixing machine to mix different grades of sawdust without a screening device.

Inquiry No. 4013.—Who manufactures Bell Metal Powder made to match Sargent's O. P. Finish. This powder is made for spray purposes.

Inquiry No. 4014.—Where may we purchase powdered solder.

Wanted—Equipment and Supplies.

SAVE SCRAP "THE SCRAP NICKEL MARKET SINCE 1909"

We are paying special prices for any quantity of scrap.

NICKEL ANODES • • CADMIUM ANODES • • NICKEL STRIPPINGS

Discarded plating room scrap of all kinds.
Write—Phone—Wire
HIGHEST PRICES—IMMEDIATE RETURNS

METALLURGICAL PRODUCTS CO.
1227-29 E. Berks St. Philadelphia, Pa.

BUSINESS WANTS

SITUATIONS OPEN

Display Advertisements, One Column Wide, $3 per inch, Each Insertion

SITUATION OPEN

Salesmen and Jobbers wanted to sell established line of Polishing and Buffing Compositions. Several choice territories open. In reply give full details and territory desired.

McAleer Manufacturing Co., Detroit, Mich.

WANTED—Manufacturers representatives in larger centers to sell our Hand Operated Die Casting Machines and Die Castings on commission. Machine has been in successful operation for several years.

THO-GREN METALSMITHS CO.
859 East Tenth St. Erie, Pa.

If you are looking for a manager, superintendent, salesman or foreman, METAL INDUSTRY can get one for you.

REPRESENTATIVES

Rio De Janeiro Representation

Reputable importing house of industrial chemicals representing outstanding European and American firms now prepared to handle additional representations. Manufacturers interested in introducing their line on the Brazilian market please communicate with B. Herzog, Rua General Camara, 211/213 Rio de Janeiro; or with representative now in New York, A. Brickman, 2313 East 23rd St., Brooklyn, N. Y.

MANUFACTURERS ATTENTION!

Do you contemplate a change on your representation in Minnesota and adjacent territory? Live wire organization fully equipped to obtain results desires additional line.

Address Minnesota, care of Metal Industry.

SITUATIONS WANTED

Display Advertisements, One Column Wide, $1 per inch, Each Insertion

SALESMAN

SITUATION WANTED—Young man, 26 years of age, married, desires position as Salesman in the plating or allied industries. Salary secondary, real ambition is to connect with reputable concern with a chance for advancement. Willing to co-operate with employer to the fullest extent.

Sincere, care of Metal Industry.

METALLURGIST AND CHEMIST

Situation Wanted—Metallurgist and chemist, university graduate, 20 years experience in hardware, machinery and automotive fields. Ferrous and non-ferrous metals. Heat treatment, chemical analysis, physical testing and electroplating. References, moderate salary.

Testing, care of Metal Industry

Foreman Plater

Situation Wanted—By a foreman plater who desires to connect with a reliable firm where the services of a competent man is indispensable, and where executive ability and chemical control in the finishing and plating departments is essential. Am qualified by years of practical experience in large and small shops and with an intimate technical knowledge of all standard and special solutions. Am thoroughly familiar with modern practice and developments in the deposition of chromium, cadmium, gold, silver, nickel, black nickel, brass, bronze, copper, zinc and tin plating upon ferrous and non-ferrous metals by the full automatic, semi-automatic, still tank and mechanical barrel processes, also the anodic oxidization of aluminum, rust-proofing steel, oxidizing, lacquering and ball burnishing. The applicant has initiative and is a man of good judgment in both the handling of help as well as material. A permanent position with a dependable concern would be appreciated more than a large salary. Location unimportant. Excellent references submitted.

Address Anodic, care of Metal Industry

BUSINESS WANTS

SITUATATIONS WANTED

Display Advertisements, One Column Wide, $1 per inch, Each Insertion.

ATTENTION PLATERS!

Chemical Analyses of Electro-Plating Solutions. 27 lesson plans easy to follow and understand. Fundamental Theory; Definition of Analyses; Volumetric Apparatus, its manipulation and use; Standard Solutions; Indicators, their use; Titration Analytical Methods. Required laboratory equipment and applications. This is what every Plater should have; Same can be had for $1.50.

Phila. Electro-Platers Class.
R. E. Jackson, Jr., Secy.
125 E. Allen St. Phila, Penna.

SALES and PROMOTION

Situation Wanted—By former member of Metal Industry and Platers' Guide editorial staff. Capable of preparing promotional material of all kinds; catalogs; letters; advertising. Considerable industrial experience previous to editorial occupation. Part time work in promotional or sales capacity considered.

V. L., care of Metal Industry.

SITUATION WANTED—A mechanically inclined young man of 20, seeks apprenticeship training in a machine shop. Have knowledge of mechanical drawing and shop work. Salary is secondary.

A. B., care of Metal Industry.

SALES ENGINEER

Situation Wanted—Sales Engineer calling on Picklers and Electroplaters in Metropolitan and New England territories desires representation well established house with good rating.

Sales Engineer care of Metal Industry.

If you are looking for any kind of a position, a Want Ad in METAL INDUSTRY will secure for you that position.

ELECTROPLATING CHEMIST

Situation Wanted—Young man, married, dependable, with four years experience in electroplating research laboratory. Work covered the analysis of various plating solutions. Also the carrying on of new plating developments; the installation and servicing of plating processes, the supervising of the laboratory staff including the answering of correspondence pertaining to general plating matters. Also six years experience in the assay and refining of precious metals.

Assay care of Metal Industry

METAL INDUSTRY BOOKS

BOOK ORDERS ARE PAYABLE IN ADVANCE

METALLURGICAL

MIXED METALS OR METALLIC ALLOYS. A. H. Hiorns, 5½ x 6¾ inches; 434 pages; 45 illustrations ..... Price $2.50

The best book published on the subject for this price. Takes up the subject where ordinary metallurgical treatises leave off, deals fully with metallic mixtures, and shows how such mixtures are usefully employed. Numerous tables of data and a section on alloys for special purposes are included.

PRACTICAL ALLOYING. By Buchanan. Size 6 x 9 inches 5.00

This book, which has run into several editions, still remains one of the best and most trustworthy works on alloys from the practical standpoint. It is written by a thoroughly practical man, a foundryman and alloyer, for men of the same type. He writes in an easy, conversational style, clear and direct. The information is accurate, trustworthy and well indexed. It should be in the hands of everyone who works with metals and alloys.

A LIST OF ALLOYS. Prepared by William Campbell. 6 x 9 inches; 65 pages. Paper bound, $1.50; cloth, $2.00. ..... 1.50

This is a revision and amplification of the list which Professor Campbell prepared in 1922, and includes, in addition to the chemical compositions, the physical properties of many typical alloys. The list has proved of great value as a reference to a vast number of alloys which have names not easily recognized, and for those needing such a reference, it is the only available source.

METAL INDUSTRY, 116 JOHN STREET, NEW YORK, N. Y.

BOOK ORDERS ARE PAYABLE IN ADVANCE

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 42*

ABRASIVES (Also see Emery)

Artificial

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Emery

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Stevens, Inc., Frederic, B., Detroit, Mich.

ACID PIPE

American Hard Rubber Co., New York, N. Y.
Belke Mfg. Co., Chicago, Ill.

ACID PROOF PIPE

Resistance, Hard Rubber

Belke Mfg. Co., Chicago, Ill.
General Ceramics Co., New York.
The B. F. Goodrich Rubber Co., Akron, Ohio.

ACIDITY TESTING APPARATUS

Thwing Instrument Co., Phila, Pa.

ACIDS

Boracic

Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

Chromic

Chas. Cooper & Co., New York.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.

Hydrofluoric

General Chemical Co., Philadelphia, Pa.
Harshaw Chemical Co., The, Cleveland, Ohio.

Oil of Vitriol (Sulphuric)

Zapon Co., The, New York, N. Y.

AEROPLANE DOPE

Egyptian Lacquer Mfg. Co., New York.
Zapon Co., The, New York, N. Y.

AGITATORS FOR PLATING SOLUTIONS

Belke Mfg. Co., Chicago, Ill.

Mechanical

Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

AIR FILTERS

Kirk & Blum Mfg. Co., Cincinnati, Ohio.

ALLOYS (See also Kind Wated.)

Non-Ferrous

Seymour Mfg. Co., Seymour, Conn.

Brass, Bronze, Nickel, Silver

Seymour Mfg. Co., Seymour, Conn.

ALUMINUM (See Ingots, Sheets, Wire Rods, etc.)

Sheet

Arthur Seligman & Co., Inc., New York.
Strahs Aluminum Co., New York.

ALUMINUM CLEANER

Magnus Chemical Co., Garwood, N. J.

ALUMINUM INGOT

Arthur Seligman & Co., Inc., New York.

AMMETERS (See also Electrical Apparatus and Equipment.)

Columbia Elec. Mfg. Co., Cleveland. Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

AMYL ACETATE

Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon Co., The, New York, N. Y.

ANNEALING FURNACES

Electric

Oil or Gas

ANODES

All Metals

Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

Brass and Bronze

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid Incorporated, Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Seymour Mfg. Co., Seymour, Conn.

Cadmium

Grasselli Chemical Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

Copper

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio
MacDermid Incorporated, Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.

Lead

Harshaw Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

Nickel

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid Incorporated, Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

Tin

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

Zinc

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
McGean Chemical Co., The, Cleveland, Ohio.

AUTOMATIC METAL CLEANING MACHINES

N. Ransohoff, Inc., Cincinnati, Ohio.

AUTOMATIC POLISHING MACHINES

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hammond Mach. Builders, Inc., Kalamazoo, Mich.

AUTOMATIC WIRE AND SHEET METAL WORKING MACHINERY

Baird Machine Co., Bridgeport, Conn.

BALL BURNISHING EQUIPMENT (Also see Burnishing and Polishing Barrels.)

Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
N. Ransohoff, Inc., Cincinnati, Ohio.

BASKETS, DIPPING

General Ceramics Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLAST GATES

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLOWERS AND BLOW PIPING (See also Exhaust Fans and Heads.)

Allington & Curtis Co., Saginaw, Mich.
Astle, H. J. & Co., Providence, R. I.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLOWERS AND EXHAUSTERS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLOWER SYSTEMS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BRASS FINISHERS' SOAP

Magnus Chemical Co., Garwood, N. J.

BRASS MILL PRODUCTS

Baltimore Brass Co., Baltimore, Md.
Seymour Mfg. Co., Seymour, Conn.
Western Cartridge Co., East Alton, Ill.

BRASS; SHEET, WIRE, ROD, TUBE (Also see Wire Mill Products, Rods and Bars, Sheets; Strip Metals; Tubes; Wire, Etc.)

American Brass Co., Waterbury, Conn.
Bristol Brass Co., Bristol, Conn.
Seymour Mfg. Co., Seymour, Conn.
Western Cartridge Co., Alton, Ill.
Waterbury Rolling Mills, Waterbury, Conn.

BRIGHTENERS (For Plating Solutions.)

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BRONZE (See Also Anodes; Castings; Forgings; Ingots; Powdered; Rods and Bars; Tubes, Etc.)

Western Cartridge Co., Alton, Ill.

Phosphor, Tobin, Manganese

Seymour Mfg. Co., Seymour, Conn.

BRONZING LIQUID

Egyptian Lacquer Mfg. Co., New York.
Zapon Co., The, Stamford, Conn.

BRUSHES

Hand

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Wheel

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFING COMPOUND CLEANERS

International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc., New York.

BUFFING AND POLISHING COMPOSITION

Beam-Knodel, Inc., New York.
Belke Mfg. Co., Chicago, Ill.
Bruce Products Corporation, Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Chas. F. L'Hommedieu & Sons, Co., Chicago, Ill.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Chciago, Ill.—Glen Ridge, N. J.

BUFFING AND POLISHING MACHINES

Production Machine Co., Greenfield, Mass.

Electric

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFING MACHINES, AUTOMATIC (Also see Polishing Lathes and Heads.)

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFING AND POLISHING WHEELS (Also see Buffs.)

Canvas, Cotton, Etc.

Bruce Products Corporation, Detroit, Mich.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lea Mfg. Co., The, Waterbury, Conn.
Chas. F. L'Hommedieu & Sons, Co., Chicago, Ill.
MacFarland Mfg. Co., Long Island City, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
The Matchless Metal Polish Co., Glen Ridge, N. J.
Williamsville Buff Mfg. Co., Danielson, Conn.
Yerges Buff Co., Fremont, Ohio.

Felt

Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
Yerges Buff Co., Fremont, Ohio.

Leather

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Sheepskin

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFS (Used)

Detroit Buff Co., Inc., Detroit, Mich.

BUFFS (Also see Buffing and Polishing Wheels.)

Bruce Products Corporation, Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Co., Chicago, Ill.
MacDermid Incorporated, Waterbury, Conn.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J. and Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Williamsville Buff Mfg. Co., Danielson, Conn.
Yerges Buff Co., Fremont, Ohio.

BUFFS, STAINLESS STEEL

Hanson-Van Winkle-Munning Co., Matawan, N. J.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J. and Chicago, Ill.
Williamsville Buff Mfg. Co., Danielson, Conn.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 42*

BURNERS (Also see Furnaces.)

Air and Gas Pre-Mixing

Campbell-Hausfeld Co., Harrison, Ohio.

Burnishing and Polishing Barrels

Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Ransohoff, N., Inc., Cincinnati, Ohio.
Smith-Richardson Co., Attleboro, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

BURNISHING COMPOUNDS AND CHIPS (Also see Soap.)

International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.

BURNISHING MACHINES

Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Belke Mfg. Co., Chicago, Ill.
Smith-Richardson Co., Attleboro, Mass.

CADMIUM

Grasselli Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

CADMIUM OXIDE

Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

CADMIUM PLATING

Grasselli Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

CAUSTIC SODA

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
McGean Chemical Co., The, Cleveland, Ohio.

CHEMICAL ENGINEERS

A. Kenneth Graham & Associates, Jenkintown, Pa.

CHEMICALS, DEALERS IN ALL KINDS (Also see Kind Wanted.)

Platers

Cooper & Co., Chas., New York.
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

CHLORIDE

Nickel

Harshaw Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.

CHROMIC ACID

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.
Mutual Chemical Co. of America, New York, N. Y.

CHROMIUM PLATING PROCESS

United Chromium, Inc., New York.

CHROMIUM PLATING TANKS

American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
General Ceramics Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.

CHROMIUM PLATING MACHINERY

Chas. F. L'Hommedieu & Sons., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

CHROMIUM PLATING FUMES EXHAUST SYSTEMS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

CHROMIUM PLATING POLISH

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

CHUCKING MACHINES, AUTOMATIC

Baird Machine Co., Bridgeport, Conn.

CLEANERS, METAL

Bruce Products Corporation, Detroit, Mich.
Ford, J. B. Co., Wyandotte, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.
Philadelphia Quartz Co., Philadelphia, Pa.
Sulphur Products Co., Greensburg, Pa.
Udylite Process Co., Detroit, Mich.

CLEANING APPARATUS, AUTOMATIC METAL (Also see Pickling Machines.)

Ransohoff, N., & Co., Cincinnati, Ohio.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

CLEANING COMPOUNDS (See also Fig Cleaner; Pickling Compounds, Whale Oil Soaps.)

Metal

Ford, J. B., Co., Wyandotte, Mich.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.
Philadelphia Quartz Co., Philadelphia, Pa.
Stevens, Inc., Frederic B., Detroit, Mich.

CLEANING SYSTEMS (Vacuum.)

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

COCK GRINDERS

COLLECTING SYSTEMS (Dust, Shavings, Sawdust, Dust Metal.)

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

COMMUTATORS

Belke Mfg. Co., Chicago, Ill.

COMPOSITION METAL (See Castings; Ingot, Etc.)

Greaseless for Metal Finishing

Lea Mfg. Co., The, Waterbury, Conn.

COMPOSITIONS (See Buffing and Polishing Composition; Flooring Composition.)

Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Chas. F. L'Hommedieu & Sons, Co., Chicago, Ill.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.

COMPOUNDS, CUTTING AND GRINDING DRAWINGS, STAMPING

Bruce Products Corporation, Detroit, Mich.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.

CONVEYING SYSTEMS (Pneumatic Light and Heavy Materials.)

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

CONSULTANTS

A. Kenneth Graham & Associates, Jenkintown, Pa.

COPPER (Also see Anodes; Castings; Ingots; Rods and Bars; Sheets; Smelters and Refiners; Strip Metal; Tubes; Wire, Etc.)

Sheet, Wire, Rod, Tube

American Brass Co., Waterbury, Conn.

COPPER BEARING MATERIAL, BUYERS OF (See Drosses, Residues, Etc.)

COPPER CARBONATE OF

Cooper, Chas. & Co., New York, N. Y.
du Pont de Nemours & Co., E. I., Inc., The, R. & H. Chemicals Dept., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

COPPER-CYANIDE

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

CORE MACHINES

Stevens, Inc., Frederic B., Detroit, Mich.

CORE OIL AND COMPOUNDS

Stevens, Inc., Frederic B., Detroit, Mich.

CORE OVEN INSULATION (See Brick Insulating; Insulating Cement; Insulating Oven.)

CORE OVENS

Coal and Coke

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.

Oil and Gas

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.

CRUCIBLES, METAL MELTING

Stevens, Inc., Frederic B., Detroit, Mich.

CUTTING, STRAIGHTENING FORMING & EXTRUDING MACHINERY

Wire

Baird Machine Co., Bridgeport, Conn.

Strip Metal

Baird Machine Co., Bridgeport, Conn.

CYANIDES

Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.

CYANIDE OF SODIUM

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

DIPPING BASKETS

Dipping and Plating

Allington & Curtis Co., Saginaw, Mich.
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
United States Rubber Co., New York.

Stoneware

General Ceramics Co., New York.

DRYING-OUT MACHINES (See also Centrifugal Dryers and Extractors; Sawdust Drying-Out Boxes.)

Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Automatic

Astle, H. J., & Co., Providence, R. I.

DUST ARRESTORS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Cloth Screen

Kirk & Blum Mfg. Co., Cincinnati, Ohio.

DUST COLLECTORS AND VENTILATING SYSTEMS (Also see Exhaust Fans and Heads.)

Allington & Curtis Co., Saginaw, Mich.
Astle, H. J., & Co., Providence, R. I.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 42*

DUST COLLECTING OUTFIT, POLISHING
Astle, H. J., & Co., Inc., Providence, R. I.
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

DYNAMOS, LOW VOLTAGE, PLATING AND GALVANIZING (Also see Electrical Apparatus and Equipment.)
Bogue, Chas. J., Electric Co., New York, N. Y.
Columbia Elec. Mfg. Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

DYNAMOS, PLATING, USED
M. E. Baker Co., Boston, Mass.
Holland J., Sons, Brooklyn, N. Y.

ELECTRIC OVENS
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

ELECTRICAL APPARATUS AND EQUIPMENT (Also see Ammeters, Rheostats, Switchboards, Transformers, Voltmeters.)
Bogue, Chas, J., Electric Co., New York.
Columbia Elec. Mfg. Co., Cleveland. Ohio.
Udylite Process Co., Detroit, Mich.

ELECTRO GALVANIZING EQUIPMENT AND SUPPLIES (See Dynamos; Plating Barrels; Plating Machines, Automatic; Tanks, Etc.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
Beam-Knodel, Inc., Chicago, Ill.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Co., Chicago, Ill.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO PLATING, JOB & CONTRACT (Also see Polishing and Burnishing; Plating, Barrel Method.)

ELECTRO PLATING & GALVANIZING BARRELS
Beam-Knodel, Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

ELECTRO PLATING TANKS
Belke Mfg. Co., Chicago, Ill.
General Ceramics Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

ELECTROTYPING EQUIPMENT & SUPPLIES
Hanson-Van Winkle-Munning Co., Matawan, N. J.

EMERY (Also see Abrasives.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.

EMERY PASTE
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

ENAMEL STRIPPERS
Bruce Products Corporation, Detroit, Mich.

ENAMELS
Colored
Agate Lacquer Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

Lacquer
Agate Lacquer Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

Wood
Agate Lacquer Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

ENGINEERS
Consulting Chemists
International Chemical Co., Philadelphia, Pa.

Furnace
Campbell-Hausfeld Co., Harrison, Ohio.

EQUIPMENT
Chromium Plating
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Electro Plating
Hanson-Van Winkle-Munning Co., Matawan, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ETHYL ACETATE
Zapon Co., The, Stamford, Conn.

EXHAUST SYSTEMS
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

EXTRUDED SHAPES
Brass, Copper and Bronze

EYE PROTECTORS
Chicago Eye Shield Co., Chicago, Ill.

FANS (Exhaust.)
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

FEEDERS (Furnace, Wood Waste.)
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

FELT, POLISHING
Eastern Felt Co., Winchester, Mass.

FELT POLISHING WHEELS
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.

FELT SHEETS
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

FELT WHEELS
Bruce Products Corporation, Detroit, Mich.
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

FIG CLEANERS (Also see Cleaning Compounds, Whale Oil Soap.)
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.

FILTER AERATING & AGITATING SYSTEM
Belke Mfg. Co., Chicago, Ill.

FILTER SYSTEM FOR PLATING SOLUTIONS
Belke Mfg. Co., Chicago, Ill.
Sterling Filter Mfg. Co., Providence, R. I.

FILTER, TANK
Belke Mfg. Co., Chicago, Ill.

FLUXES
Brazing, Soldering, Thinning and Welding
Bruce Products Corporation, Detroit, Mich.
Grasselli Chemical Co., The, Cleveland, Ohio.

FOUNDRY FACINGS
Stevens, Inc., Frederic B., Detroit, Mich.

FURNACE STOKERS
Refuse and Wood Fuel
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

FURNACES (See Annealing Furnaces; Burners; Electric Furnaces; Galvanizing & Tinning Furnaces; Heat Treating Furnaces; Melting Furnaces; Powdered Coal Burning Furnaces; Sherardizing Furnaces; Smelting Furnaces.)
Campbell-Hausfeld Co., Harrison, Ohio.
Fisher, Alfred, Furnace Co., Chicago, Ill.

FUSE METAL
Platt Bros. & Co., Waterbury, Conn.

GALVANIZING AND TINNING FURNACES (Also see Burners.)

GALVANIZING EQUIPMENT AND SUPPLIES
(See Kinds Wanted. Also Plating Galvanizing Machines. Automatic; Hot and Galvanizing Barrels; Plating and Galvanizing and Tinning Equipment.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

GENERATORS (See Dynamos; Motor-Generater Sets.)
Belke Mfg. Co., Chicago, Ill.
Beam-Knodel, Inc., New York.
Bogue Electric Co., Chas. J., Hoboken, N. J.
Columbia Elec. Mfg. Co., Cleveland. Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Co., Chicago, Ill.
Stevens Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

GLUE FOR POLISHING
Hanson-Van Winkle-Munning Co., Matawan, N. J.

GLUE HEATERS AND POTS
Hanson-Van Winkle-Munning Co., Matawan, N. J.

GOLD (See Anodes; Bars; Metal Dealers; Smelters and Refiners.)

GRAPHITE PRODUCTS, POSPHORIZERS, STIRRERS, ETC.
(Inquire Metal Industry, New York)

GREASELESS COMPOSITIONS
Lea Mfg. Co., The, Waterbury, Conn.
The Matchless Metal Polish Co., Glen Ridge, N. J.

GRINDERS & BUFFERS
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Production Mach. Co., Greenfield, Mass.

GRINDING COMPOUNDS
International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc.. New York.

GRINDING MACHINES
Bruce Products Corporation, Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Portable

HARD RUBBER FITTINGS
American Hard Rubber Co., New York.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.
Udylite Process Co., Detroit, Mich.

Pipe
Belke Mfg. Co., Chicago, Ill.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.
Udylite Process Co., Detroit, Mich.

Hard Rubber Tanks
American Hard Rubber Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.

HOODS (Also see Dust Collectors and Ventilating Systems.)
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

HYDROGEN-ION EQUIPMENT
Thwing Instrument Co., Phila, Pa.

HYDROGEN PEROXIDE
McGean Chemical Co., The, Cleveland, Ohio.

INGOTS (Also see Calcium-Copper; Manganese-Copper; Phosphor-Copper; Phosphor-Tin; Silicon-Copper; Smelters and Refiners.)
Aluminum
Arthur Seligman & Co., Inc., New York.
Strahs Aluminum Co., New York.

INSULATION (Also see Brick, Insulating, Insulating Cement.)
Pipe
American Hard Rubber Co., New York, N. Y.
Goodrich Rubber Co., B. F., Akron, Ohio.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

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JAPAN REMOVERS
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.

JAPANS, ALL KINDS
Zapon Co., The, Stamford, Conn.

LACQUER ENAMELS (See Enamels.)
Zapon, The, Co., Stamford, Conn.

LACQUERS
Colored
Agate Lacquer Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

For Incandescent Lamps
Zapon, The, Co., Stamford, Conn.

Metal
Agate Lacquer Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

Wood
Agate Lacquer Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York.
Zapon, The, Co., Stamford, Conn.

LACQUER REMOVERS
Egyptian Lacquer Mfg. Co., New York.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.
Zapon, The, Co., Stamford, Conn.

LATHES (See also Polishing Lathes.)
Electric
Columbia Elec. Mfg. Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

Polishing
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

LUBRICANTS (Cutting and Grinding, Drawing, Stamping.)
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.

MACHINERY
Cleaning Metal (Mech.)
N. Ransohoff, Inc., Cincinnati, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

Dry Metal (Mech.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

Metal Drying
Ransohoff, N., Co., Inc., Cincinnati, Ohio.

Pickling Metal (Mech.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. P. L'Hommedieu & Sons, Chicago, Ill.
N. Ransohoff, Inc., Cincinnati, Ohio.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Galvanizing (Mechanical)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

Plating (Mechanical)
Hanson-Van Winkle-Munning Co., Matawan, N. J.

MANGANESE-COPPER (Also see Ingots.)
(Inquire Metal Industry, New York)

MANTLE DIP
Zapon Co., The, Stamford, Conn.

MELTING FURNACES (Also see Burners; Galvanizing and Tinning Furnaces; Tank Furnaces.)
Pit
Campbell-Hausfeld Co., Harrison, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.

METAL CLEANERS (See also Cleaning Compounds.)
Ford, J. B., Co., Wyandotte, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., Brooklyn, N. Y.
Philadelphia Quartz Co., Philadelphia, Pa.
Sulphur Products Co., Greensburg, Pa.
Udylite Process Co., Detroit, Mich.

METAL DEALERS (Also see Dresses, Residues, Etc., Buyers of: Turnings, Chips, Anodes, Etc., Buyers of.)
Gold, Silver, Platinum
Metallurgical Products Co., Philadelphia, Pa.

METAL DRYERS, CENTRIFUGAL
Ransohoff, N., Inc., Cincinnati, Ohio.

METAL POLISH
Harrison & Co., Haverhill, Mass.
International Chemical Co., Philadelphia, Pa.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.

MOLDS (See also Mold Makers.)
Babbitt and Solder
Schweizer, Chas. K., St. Louis, Mo.
Ingot
Schweizer, Chas. K., St. Louis, Mo.

MONEL METAL POLISH
International Chemical Co., Philadelphia, Pa.

MOTORS (Also see Electrical Apparatus and Equipment.)
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.

MOTOR-GENERATOR SETS (Also see Dynamos; Electrical Apparatus and Equipment.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. P. L'Hommedieu & Sons, Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

Plating and Galvanizing
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

MUNTZ METAL (See Sheets.)

NICKEL CARBONATE, MOIST AND DRY
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

NICKEL CHLORIDE
Cooper & Co., Chas., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

NICKEL DETERMINATION APPARATUS
(Inquire Metal Industry, New York)

NICKEL SALTS
du Pont de Nemours & Co., E. I., Inc., The A. & H. Chemicals Dept., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid, Inc., Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.

NICKEL SHOT
Seymour Mfg. Co., Seymour, Conn.

NICKEL SILVER (See also Brass, Sheets, Wire, Rod, Tube Castings; Forgings, Sheets; etc.)
Western Cartridge Co., Alton, Ill.

Sheets, Wire, Rod, Tube
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.

NICKEL SULPHATE, SINGLE AND DOUBLE
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.

OVENS (Also see Burners; also Core Ovens.)
Enameling, Lacquering, Japanning
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

OXIDIZING SOLUTIONS
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Sulphur Products Co., Greensburg, Pa.

PEWTER
(Inquire Metal Industry, New York)

pH PORTABLE EQUIPMENT
Thwing Instrument Co., Phila, Pa.

PHOSPHOR BRONZE (See also Ingots.)
Western Cartridge Co., Alton, Ill.

PHOSPHORUS
General Chemical Co., Philadelphia, Pa.

PICKLING TANKS
American Hard Rubber Co., New York, N. Y.
General Ceramics Co., New York.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

PINE AND FITTINGS
Acid Proof, Hard Rubber
American Hard Rubber Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.

PLATED AND POLISHED SHEET METALS (See also Sheets.)
American Nickeloid Co., Peru, Ill.

PLATERS' BUCKETS, DIPPERS & PITCHERS
Belke Mfg. Co., Chicago, Ill.

PLATER CHEMICALS AND ACIDS
International Chemical Co., Philadelphia, Pa.
Mutual Chemical Co. of America, New York, N. Y.

PLATERS METAL
(Inquire Metal Industry, New York)

PLATERS' SUPPLIES
Beam-Knodel, Inc., New York.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

PLATING
Cadmium
Grasselli Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

PLATING BARRELS, ROTARY
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. P. L'Hommedieu & Sons, Co., Chicago, Ill
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn N. Y.

PLATING AND GALVANIZING BARRELS
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PLATING AND GALVANIZING MACHINES, AUTOMATIC (Also see Plating Barrels.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn N. Y.

PLATING GENERATORS
Bogue Electric Co., Chas. J., Hoboken, N. J.
Columbia Elec. Mfg. Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Holland, J., & Sons, Brooklyn, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

PLATING MATERIALS
Bruce Products Corporation, Detroit, Mich.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 42*

PLATING RACKS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

PLATING SOLUTIONS
Special Chemicals Corp., New York, N. Y.

PLATING SOLUTION AGITATOR
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

PLATING SOLUTION FILTER SYSTEM
Belke Mfg. Co., Chicago, Ill.

PLATING TANKS
American Hard Rubber Co., New York, N. Y.
General Ceramics Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PNEUMATIC CONVEYORS
Bulk Materials
Allington & Curtis Mfg. Co., The, Saginaw, Mich.

POLISHERS, FLOOR AND BENCH
Astle, H. J., & Co., Providence, R. I.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Production Mach. Co., Greenfield, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING ABRASIVES
Bruce Products Corporation, Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

POLISHING CEMENT
Harrison & Company, Haverhill, Mass.
M. P. Iding Disc Grinding Compound Co., Milwaukee, Wis.

POLISHING COMPOSITIONS (See Buffing and Polishing Compositions.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., The, Waterbury, Conn.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING EQUIPMENT AND SUPPLIES (See also Kinds Wanted.)
Beam-Knodel, Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Used
Baker, M. E. Co., The, Boston, Mass.

POLISHING FELTS
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

POLISHING LATHES AND HEADS
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Production Mach. Co., Greenfield, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING MACHINES (Also see Polishing Lathes and Heads.)
Automatic
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING MATERIALS
Beam-Knodel, Inc., New York.
Bruce Products Corporation, Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
MacFarland Mfg. Co., Long Island City, N. Y.

POLISHING WHEELS (See also Buffing and Polishing Wheels.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
The Matchless Metal Polish Co., Glen Ridge, N. J.
Yerges Buff Co., Toledo, Ohio.

POTASH
First Sorts
Harshaw Chemical Co., The, Cleveland, Ohio.
Real
Harshaw Chemical Co., The, Cleveland, Ohio.

POTASSIUM CYANIDE
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

POTENTIOMETER
Checking and Calibrating
Thwing Instrument Co., Phila, Pa.

PRESSES (Also see Scrap Baling Machine.)
Bench and Foot
Baird Machine Co., Bridgeport, Conn.
Power, All Types
Baird Machine Co., Bridgeport, Conn.

PROCESS (Chromium)
United Chromium, Inc., New York.

PUMPS
Hard Rubber, Acid Proof
American Hard Rubber Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.

PYROMETERS (Centrifugal) (For Brass and Aluminum.)
Illinois Testing Laboratories, Inc., Chicago, Ill.
Russell Electric Co., Chicago, Ill.
Thwing Instrument Co., Phila., Pa.

RACKS—RUBBER COVERING FOR
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Goodrich Rubber Co., B. F. Akron, Ohio.
Plating
Belke Mfg. Co., Chicago, Ill.

RHEOSTATS (See also Electrical Apparatus and Equipment.)
Beam-Knodel, Inc., New York.
Belke Mfg. Co., Chicago, Ill.
Columbia Elec. Mfg. Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

RESPIRATORS
Chicago Eye Shield Co., Chicago, Ill.

RHODIUM
Special Chemicals Corp., New York, N. Y.

RODS AND BARS (Also see Brass Mill Products.)
Aluminum
Strahs Aluminum Co., New York.

ROUGE (See also Buffing and Polishing Compositions.)
Bruce Products Corporation, Detroit, Mich.
Harrison & Co., Haverhill, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

RUBBER TANKS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Goodrich Rubber Co., B. F., Akron, Ohio.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.

RUST PREVENTATIVES
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.

RUST PROOF PROCESS
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Udylite Process Co., Detroit, Mich.

RUST REMOVERS
International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc., New York.

SAND BLASTS (Inquire)
Cabinet
Astle, H. J., & Co., Providence, R. I.
Leiman Bros., Newark, N. J.

SAWDUST
Frank Miller & Sons, Chicago, Ill.
Shavings & Sawdust Co., Chicago, Ill.

SAWDUST DRYING-OUT BOXES (Also see Drying-Out Machines.)
Ransohoff, N., Inc., Cincinnati, Ohio.
Smith-Richardson Co., Attleboro, Mass.

SHEEPSKIN POLISHING WHEELS
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.

SHEET FELT
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

SHEET METAL WORK
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

SHEETS (Also see Brass Mill Products; Strip Metal.)
Aluminum
Strahs Aluminum Co., New York.
Brass, Copper and Nickel-Silver
Bristol Brass Co., Bristol, Conn.
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rollings Mills, Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.
Copper
Nickel-Silver
Seymour Mfg. Co., Seymour, Conn.
Waterbury Rolling Mills, Waterbury, Conn.
Plated and Polished
American Nickeloid Co., Peru, Ill.
Silver, Sterling
Handy & Harmon Co., New York.
Zinc
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

SHERARDIZING
Grasselli Chemical Co., The, Cleveland, Ohio.

SILVER ANODES
Handy & Harman, New York.

SILVER CHLORIDE
Cooper, Chas., & Co., New York, N. Y.

SILVER CYANIDE
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Udylite Process Co., Detroit, Mich.

SILVER AND GOLD
Handy & Harman, New York.

SILVER SOLDER
Handy & Harman, New York.

SILVER STERLING
Handy & Harman, New York.

SLAB ZINC
Grasselli Chemical Co., The, Cleveland, Ohio.
Hegeler Zinc Co., Danville, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

SOAP AND SOAP CHIPS
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.

SODIUM CYANIDE
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.

SOLDER
All Kinds
(Inquire Metal Industry, New York)

SOLUTION FILTER SYSTEM
Belke Mfg. Co., Chicago, Ill.

SOLVENTS
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon Co., The, Stamford, Conn.

SPRAY BOOTH COATING
Bruce Products Corporation, Detroit, Mich.

SPRAY BOOTHS
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Kirk & Blum Mfg. Co., The, Cincinnati, Ohio.

STAINLESS STEEL COMPOSITIONS
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Glen Ridge, N. J.

STAMPING AND DRAWING
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

STEEL BALLS FOR BURNISHING BARRELS
Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.

STOKERS
Wood Fuel
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

STRIP METAL IN COIL AND ROLLS (Also see Brass Mill Products.)
Brass, Copper and Nickel Silver
Western Cartridge Co., East Alton, Ill.

TANK FILTER
Belke Mfg. Co., Chicago, Ill.

TANKS
Chromium
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Hard Rubber
Allington & Curtis Co., Saginaw, Mich.
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Goodrich Rubber Co., B. F., Akron, Ohio
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.

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Lead Lined
Abernethy, John F., & Co., Inc., Brooklyn, N. Y.
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Pickling
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
General Ceramics Co., New York.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Plating
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
General Ceramics Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Udylite Process Co., Detroit, Mich.

Steel
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Wood
Hanson-Van Winkle-Munning Co., Matawan, N. J.

TRIPOLI COMPOSITION
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.

TRIPOLI REMOVER
Magnus Chemical Co., Garwood, N. J.
International Chemical Co., Philadelphia, Pa.

TUMBLING BARRELS (Also see Burnishing and Polishing Barrels; Plating Barrels.)
All Kinds
Baird Machine Co., Bridgeport, Conn.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Ransohoff, N., Inc., Cincinnati, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.
Used
Baker, M. E. Co, The, Boston, Mass.
Foundry
Baird Machine Co., Bridgeport, Conn.

Japanning
Baird Machine Co., Bridgeport, Conn.
Ransohoff, N., Inc., Cincinnati, Ohio.

Lacquering
Baird Machine Co., Bridgeport, Conn.
Ransohoff, N., Inc., Cincinnati, Ohio.
Oblique
Baird Machine Co., Bridgeport, Conn.
Ransohoff, N., Inc., Cincinnati, Ohio.

TUMBLING COMPOUNDS
International Chemical Co., Philadelphia, Pa.

UTENSILS
Hard Rubber
American Hard Rubber Co., New York.

VALVES AND FITTINGS
Belke Mfg. Co., Chicago, Ill.
Acid Proof
American Hard Rubber Co., New York, N. Y.

VENTILATING SYSTEMS (See also Blowers and Blow Piping; Dust Collectors and Ventilating Systems; Exhaust Fans and Heads.)
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Astle, H. J. & Co., Providence, R. I.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

VIENNA LIME COMPOSITION
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

VOLTMETERS (Also see Electrical Apparatus and Equipment.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.

WASHING MACHINERY
Ransohoff, N., Inc., Cincinnati, Ohio.

WASTE CLEANER AND OIL RECLAIMER
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.

WHALE OIL SOAP (Also see Cleaning Compounds; Fig Cleaners.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
International Chemical Co., Philadelphia, Pa.

WHEELS, POLISHING
Bruce Products Corporation, Detroit, Mich.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.

WHITE POLISH
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.

WIRE
Aluminum
Strahs Aluminum Co., New York.

WIRE FORMING MACHINERY (See also Cutting, Straightening and Forming Machinery.)
Baird Machine Co., Bridgeport, Conn.

ZINC (See Slab Zinc; Smelters and Refiners; Anodes; Sheets; Strip Metal, Etc.)
Grasselli Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

ZINC ANODES
Hanson-Van Winkle-Munning Co., Matawan, N. J.

ZINC CYANIDE
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

ZINC DUST
Grasselli Chemical Co., The, Cleveland, Ohio.

ZINC, ROLLED (Also see Sheets, Zinc).
Platt Bros. & Co., Waterbury, Conn.

ZINC SALTS, COMMERCIAL
Grasselli Chemical Co., The Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.

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ALPHABETICAL LIST OF ADVERTISERS

INDEX NUMBER

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